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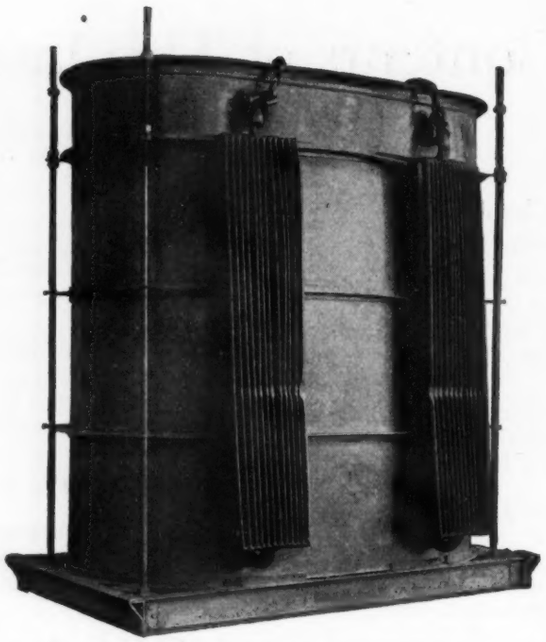
A Demonstration of the Excellence of Pittsburgh Construction



This transformer was in a railroad accident and transformer and car were thrown over. Depressions in the radiator show where transformer was smashed across the railroad tracks. With all this rough handling and terrific strain, however, no leaks appeared in the tank or radiators, demonstrating the strength of the Pittsburgh welded tank construction.

IN addition, the construction of Pittsburgh Tanks is such that large Polyphase Transformers may be handled with as little difficulty and danger as single-phase transformers. While all Pittsburgh Tanks are round or elliptical (arched), which prevents buckling, the structural steel bases on which the tanks rest are rectangular. This insures a solid foundation and eliminates the danger, expense and trouble encountered when moving transformers with round or elliptical bases on rollers.

When you have the specifications ready for your next order for transformers, let us submit proposal on Pittsburgh Transformers.

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Pittsburgh, Pennsylvania

Electrical World

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Editor

VOLUME 88 — *New York, Saturday, August 21, 1926* — NUMBER 8

Electric Circuits Should Be Largely Immune from Lightning Troubles

AT THIS season of the year, when thunderstorms are prevalent, it is not uncommon to find local lighting systems which pull feeder switches during a storm as a matter of precaution. There is no denying the fear which lightning engenders among laymen, and while the heavens will still send out their bolts, the earth need not regard them with such terror. There are means of circumventing or dissipating atmospheric electricity, and every system should avail itself of such protection. Nor are modern systems of lightning protection as vulnerable as many people imagine. Our great skyscrapers offer excellent targets, but being steel-cage structures lightning rarely harms them, the steel providing ample circuit to ground.

Grounded networks and vertical towers have also proved efficacious in protecting munition dumps and oil tanks. Greater insulation on lines and the use of lightning arresters of various forms at switching points and substations, and oftentimes on transformers themselves, have minimized the damage which results from lightning immensely. Properly protected and sectionalized, no lightning storm, however violent, should put out a whole system. The public ought to be able to rely on electric service at all times, and systems should be built strong enough to weather and outride in the main any storm. The art of lightning protection may not be absolutely reliable yet, but it has advanced considerably. The trouble is that some systems have not kept pace with developments and are twenty years behind the times. Those are the ones that fear lightning and leave their patrons in darkness while the elements rage without, attributing the outage to "an act of God" instead of to their own shortcoming.

Relieving Sweltering Humanity by Refrigerated Air

THE practice of cooling moving-picture theaters and other places of amusement artificially is spreading quite rapidly, but it ought not to stop at places of amusement. True, a commercial spirit prompts theatrical managers to keep their auditoriums at a temperature of about 70 degrees Fahrenheit, while the outside world swelters and wilts under the scorching rays of the sun or its stored heat after it has set. However, a humanitarian impulse should lead others to mitigate the terrors of midsummer in great cities to their own profit and their customers' welfare. We heat and illuminate hotels, department stores, restaurants, barber shops and other more or less public places; why not cool them artificially as well when occasion demands it? The cost is not excessive and the comfort derived is great. Electric fans are excellent in the home and in other places as well; for besides keeping air in circulation they keep away flies, mosquitoes and other insects. But a fan does not cool the air and its buzz may be objectionable Under such circumstances nothing short of refrigerated air will suffice. Those theaters which have resorted to artificial cooling find it an added attraction. With a little ozone added people will no longer find it necessary to travel to the seashore for an illusive breeze or, in interior towns, to the parks for a breath of fresh air. These can all be provided artificially, and hotels, barber shops, restaurants, etc., which now permit patrons who must use their service to sweat and grow irritable will find it good business to allay such physical and mental suffering by artificial cooling systems. Workshops can also apply refrigerated air to advantage.

Shall Rural Service Be Self-Supporting or Saddled on Urban Customers?

NOW and then some one advocates saddling the financial burden of rural electrification on urban customers, despite the fact that utility men who have studied the rural situation thoroughly contend both that rural service should be made self-supporting and that it can be made so to the benefit of the farmer. Any one who has studied the national economic situation will have to admit that improvement of farm conditions through electrification will also benefit industry and city dwellers; but if rural electric service can be made self-supporting, as studies in various states indicate that in many cases it can, then why should there be any need of burdening the city customer?

Farmers are not asking their city cousins to pay their bills, and from all observations farmers have sufficient pride not to expect city customers to shoulder any part of the rural expense. Furthermore, it is very doubtful whether the courts would allow any central-station company to saddle millions of direct and indirect investors in utilities with non-profitable rural enterprises, even if commissions did respond to pressure from the farmers. No doubt the political situation might be better if farmers were served under any condition, but if they can be served on a profitable basis, so much the better.

Some have argued that certain classes of urban business have been developed in the past at a temporary loss, therefore rural business should be handled in the same manner. However, if any non-profitable pioneering in urban business is recalled, it will be remembered that its acquisition usually permitted better utilization of an existing system investment and thus indirectly benefited other classes of business. Eventually the development of this business greatly benefited other businesses. Take, for example, industrial business with

low unit profits; how could domestic rates have been reduced without the development of this business? Acquisition of all farms as customers would not enable better utilization of the system investment at present, and it is doubtful whether development of the farm load will ever benefit urban rates.

If utilities were allowed to gamble with investors' money, it might eventually prove profitable to serve all farmers at cost initially, provided that their consumption was aggressively developed so they would become profitable customers in three to five years. If this were done, possibly more farmers would receive service from the start and more would be educated to extensive use of service five years hence, but investors would have to hold the sack meanwhile. City customers could not be expected to shoulder the burden through increased rates, because they would never benefit from the development of the business except in a national economic way.

Thus there seems to be no justification for saddling urban customers with the expense of rural electrification. It can be made to support itself if the knowledge already acquired is applied and the farmers respond to the advantages which electrical applications will give them. To be economically justified rural service will have to be limited for the time being to groups of farmers who can and will make full use of electric service so that it will be profitable to themselves and the utility companies jointly. A reasonable period must be allowed for the rural customers to obtain equipment which is adaptable to electric service. As profitable farmer groups develop other less remunerative groups can be added until eventually a large portion of the farms that are not too far apart for the use they make of the investment will be served.

Engineering Needs on Small Properties

RECENT observation of engineering practice in several small central-station systems distant from metropolitan centers suggests the desirability of more study by operating men of technical betterment work in such utilities. Granted that creditable service is rendered by many of these companies under considerable handicaps, the fact remains that standards of voltage regulation, power-factor improvement, frequency maintenance and continuity of supply are rising year by year. Because of these facts it is a primary duty of progressive companies to put their engineering houses in better order than frequently exists owing to the rapid growth of loads and multiplicity of duties carried by the small staffs of executives and engineers found on such properties

Many of these systems are "piecemeal" developments. The engineering visitor to such properties is struck over and over again by the contrasts existing between the older construction and the latest installations in generating plants, lines and substations. Much of the older plant still in service at pre-war equipment and labor costs is doing reliable work, but there are underlying weaknesses of design and construction apparent in many cases which should be looked into during the next few months. In many hydro plants, for example, the question of replacing old wheels by more efficient units should be analyzed from the economic standpoint. Water may be growing more valuable for power service in certain communities; wheel maintenance may have been of the patching-up variety; regulation may be poor, and wastes may have been overlooked in handling stream flow because of long and habitual tolerance of conditions which need remedy.

Substation designs may represent inadequate switching facilities, poor mechanical construction, too restricted spacings of apparatus and conductors, overcrowding of buildings no longer suited to company needs, or incoherence of development planning. Transmission lines and feeders may represent durable construction—thus far—but embody risks of interruption which could be remedied at relatively small cost. There is a disposition in many cases to rely too much upon the mechanical stability of very simple wooden structures in river-crossing spans, for example. The accident hazard is receiving more and more attention, we are glad to note, and many small plants have greatly improved their conductor "take-off," sometimes carrying control and auxiliary instrument wiring to outdoor substations in cable supported by steel messengers or in ducts where soil conditions allow. There are many challenges to engineering skill in small utilities, and if progress is still somewhat slow in co-ordinating old and new methods, it is making real headway among many properties which offer a fertile field for betterment work.

A Generous Contribution to Industry Statistics

THERE are few executives of the electrical industry who do not eagerly read the financial statements of the General Electric Company, Westinghouse Electric & Manufacturing Company, Allis-Chalmers Manufacturing Company and other large electrical firms and note with interest the current growth or decline of their activities. For whether his own responsibilities may be to guide a power company or a manufacturing, jobbing or large contracting business, every executive must look ahead and try to gage the times. And so he studies, at least in the newspapers, the reports of the Federal Reserve banks, the statements of the Department of Commerce, the steel industry, the car loadings and other business news week after week. But of more direct import than all these are the figures on the electrical market itself, for they spell the future for his own organization. The pity is that so little is available to him.

There is an old tradition that the financial details of a man's business are his own affairs. This still holds true. But the public responsibilities of the executives of a large corporation have come to be viewed in a new light. The company whose shares are offered in the marketplace is felt to be under a distinct obligation to the people to account for its stewardship. Why is it, then, that there are so few of our electrical manufacturers who are frankly contributing to the common knowledge the useful and important evidence that can be gained from comparative statements of sales billed, orders received, cost of sales, net income, profits avail-

able for dividends and other data that men can read in terms of market trend?

It has been the custom for the ordinary financial statements to be issued by industrial corporations annually. Within the electrical industry these have been for the most part brief. It is extremely interesting, therefore, to note the recent action of the General Electric Company in establishing a quarterly report of all the essential data published, for the information of all whom it may concern. This is encouraging to every seeker of the facts, for, though Allis-Chalmers also publishes quarterly reports, that company's figures do not segregate its purely electrical business. The other large companies still publish only annual reports and these in meager detail.

Recorded facts give a better index to conditions than speculations based on gossip and broad generalities. The publication of such detailed quarterly reports on the affairs of electrical manufacturers is of vital value to every electrical man who is endeavoring to base his judgment on realities. The General Electric Company is to be congratulated on the action it has taken. It is to be hoped that its example will prove an influence toward the ultimate organization of embracing statistics on the electrical manufacturing industry as a whole.

Transition from Building to Selling

THE day has arrived for utility executives to think in terms of selling. The executive of tomorrow will be an all-round merchant of service to his customers, holding the small two-dollar-a-month bill on the same basis as the thousand-dollar-a-month bill. His organization will have to be developed on a diversified selling basis to care for new business, the intensification of business in existing classes, the sale of energy-using devices and the servicing of these devices.

In the automotive industry a dealer a few years ago sold new cars only. Today a live dealer has new-car, used-car, commercial-car, service-parts and service departments in order to satisfy the conditions encountered in the industry. He has found that a successful business is measured in terms of satisfying the service necessities of his customers. The much-quoted embellishment of Emerson to the effect that a man who makes the best mousetrap may dwell in a wilderness, for buyers will tread a path to his doorstep, is untrue. Emerson and his more recent amplifier lived before service ideas had been inculcated in the minds of buyers by modern selling methods. Today buyers expect an assortment of mousetraps to be delivered for trial use at their doors free of charge. And unless they receive this service they depend on their house cats to rid them of vermin.

The customers of light and power companies look to the utilities for similar service and expect from them the same merchandising efforts put forth by sellers of other comforts and necessities. This fact should be recognized by the utilities as an obligation and as an opportunity. Plans should be made and an organization perfected to give this kind of service and at the same time to intensify the use of electric service in order to pay expenses and increase profits. Every-day satisfaction and not the monthly bill is a measure of the success of a utility in the mind of an ordinary customer.

Some Points Develop on Domestic Refrigeration

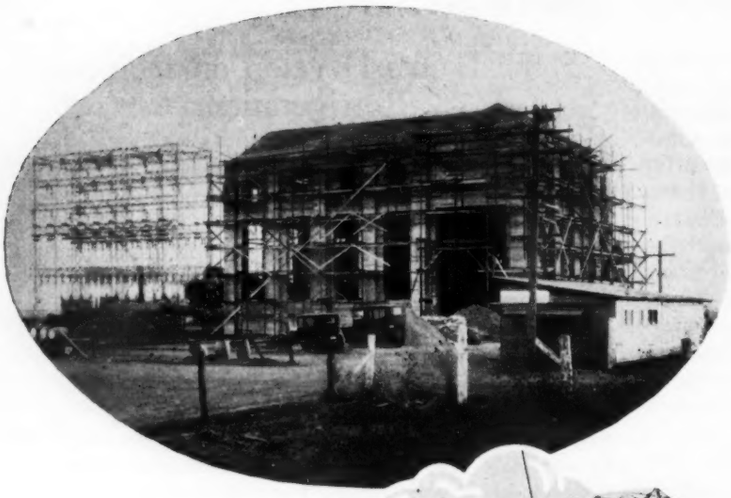
REPORTS of experiences with electric refrigeration from all parts of the country provide points which may well be considered by refrigerator manufacturers, central-station sales departments and other distributors. The manufacturer must so organize his production that each unit will be tested thoroughly and be perfect in operation when it leaves the factory. He should establish training schools for both salesmen and servicemen of the distributors. Production and warehousing must be organized so that shipments can be made promptly of refrigeration units and of supply parts. In order to help distributors it is necessary for the manufacturer to develop a sales staff of high-grade men who know the product, know good selling methods and can advise distributors on sales methods and sales organization. An advisable supplementary service is the development of advertising copy and booklets for the use of distributors. To handle the payment plans the manufacturer should study ways and means of handling the paper. This is particularly true with respect to small dealers with limited credit. The manufacturer must either carry his paper or aid him to obtain credit with his bankers.

But while the manufacturer should organize on this basis, much remains to be done by the central-station companies and other distributors. They should recognize that much thought, a good organization and ample money must be back of successful refrigeration sales. Salesmen and servicemen must be trained and specialized on refrigeration if best results are to be obtained. Every unit sold must be installed properly and serviced properly if it is to be satisfactory. Refrigerators do not sell themselves at this stage of development; their sale in volume requires high-grade salesmen who know refrigeration and who work intensively on an all-year basis. Demonstrations, advertising of the right kind, house-to-house calls and other well-known methods of pioneer selling are essential and effective aids.

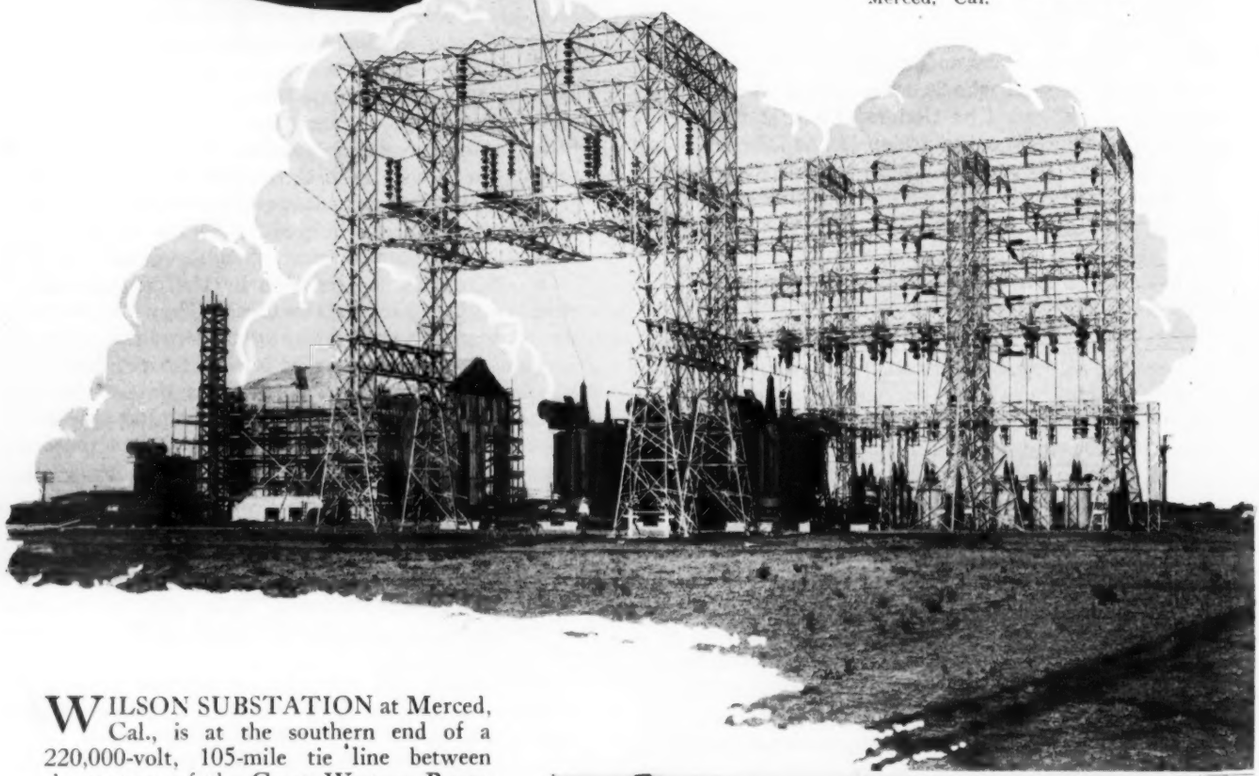
A half-hearted and unorganized attempt to sell refrigerators will bring very poor results. If this business is worth while—and the evidence shows that it is—it deserves a businesslike organization with definite objectives and the whole-hearted support of those in charge of sales. Those distributors who have gone at the business intelligently are getting fine results, and it behooves others to adopt the same methods if electric refrigeration is to be introduced on a country-wide basis without the local occurrence of black spots and bad public relations. Such local troubles can be traced to indifference, ignorance or lack of organization for sales and of service talent on the part of a manufacturer or distributor in the territory affected. It is high time to get the whole refrigeration industry organized on an intelligent basis in each locality.

Central stations that have not the merchandising experience and talent to do a real job on something so specialized as electrical refrigeration can well afford to work actively with local refrigerator distributors who have trained staffs and experience in sales. Utilities should call upon all possible brains and aid until they are able to handle the situation. Pooled resources in each community should help avoid many bad reactions.

Great Western Power and San Joaquin Light & Power Complete Interconnection



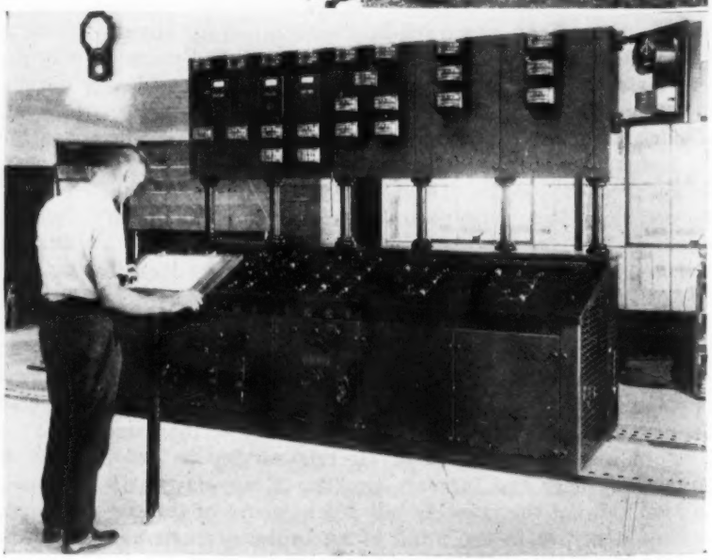
In oval, new Wilson substation and switchrack at Merced, Cal.
In center, 110-kv. bus structure at Wilson substation at Merced, Cal.
Lower view, switchboard in new Wilson substation at Merced, Cal.



WILSON SUBSTATION at Merced, Cal., is at the southern end of a 220,000-volt, 105-mile tie line between the systems of the Great Western Power Company and the San Joaquin Light & Power Corporation. The cost of the line exceeded $2,000,000 and an additional $750,000 is invested in the substation.

Diversity of load between the systems and the possibilitity of energy transfer in times of emergency justified the building of the interconnection. The line starts at Brighton, near Sacramento, and permits the transfer of energy between hydro-electric plants at a distance apart of about 450 miles. The tie will help to adjust storage and flow of water in the reservoirs and rivers of the two systems to give most economical operation of both properties.

The new interconnection has just been made and the dedication of the Wilson Substation was celebrated by a large gathering on Aug. 12.



Electrical Determination of Temperatures in Chimney Shells*

Importance of Temperature Stresses in Reinforced Concrete Chimneys Is Emphasized—Individual Thermocouple Circuits Give Best Results—Preliminary Heat-Drop Data

By E. A. DOCKSTADER
Stone & Webster, Inc., Boston, Mass.

REINFORCED concrete chimneys have been in use in this country for about 25 years. With the growth of central power stations, large reinforced concrete chimneys have become increasingly common. This type of construction has many features in its favor, particularly for chimneys superimposed on the power station structure, where the lighter weight of a reinforced concrete chimney as compared with a brick chimney is important. Cracks that have appeared in a number of reinforced concrete chimneys have led to some doubt on the part of engineers as to whether such construction is reliable. Such cracks can usually be traced to improper design, faulty workmanship or a combination of the two. It was with a view toward improving the design of these structures that the tests under discussion were made.

Theoretical analyses of the stresses in chimney shells due to the weight of the chimney and the force of the wind upon it are available. Wind velocities have been measured for many years with more or less accuracy and records kept of maximum conditions. It has, therefore, been possible to proceed with reasonable accuracy in designing reinforced concrete chimneys to resist the stresses due to dead load and wind, and for many years the emphasis in the design of chimneys has been placed on the proper proportions of shell thickness and reinforcement to resist these stresses.

*These notes were prepared by the author at the request of the ELECTRICAL WORLD and are based on his Wason medal paper presented last year before the American Concrete Institute. Their suggestiveness to our readers lies in their account of the application of thermo-electric methods to the study of temperature gradients in chimneys and hence to other channels for gas transport associated with combustion in generating plant service.—EDITOR.

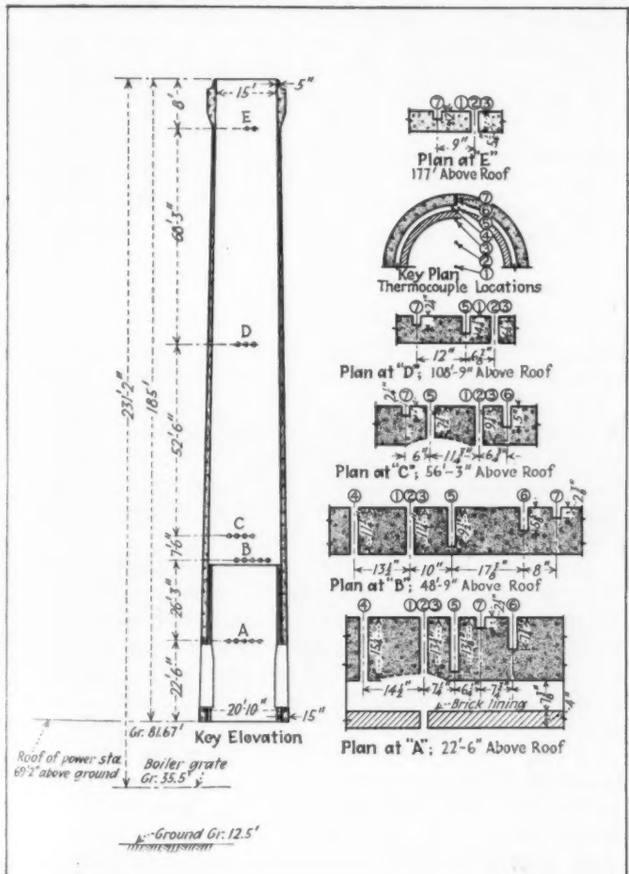

Key Elevation
Gr. 81.67'
Roof of power sta. 69'2" above ground
Boiler grate Gr: 35.5'
Ground Gr: 12.5'
Plan at "E" 177' Above Roof
Key Plan Thermocouple Locations
Plan at "D"; 106'-9" Above Roof
Plan at "C"; 56'-3" Above Roof
Plan at "B"; 48'-9" Above Roof
Plan at "A"; 22'-6" Above Roof
Brick lining

FIG. 1—DETAIL OF CHIMNEY, THERMOCOUPLE LOCATIONS, ETC.

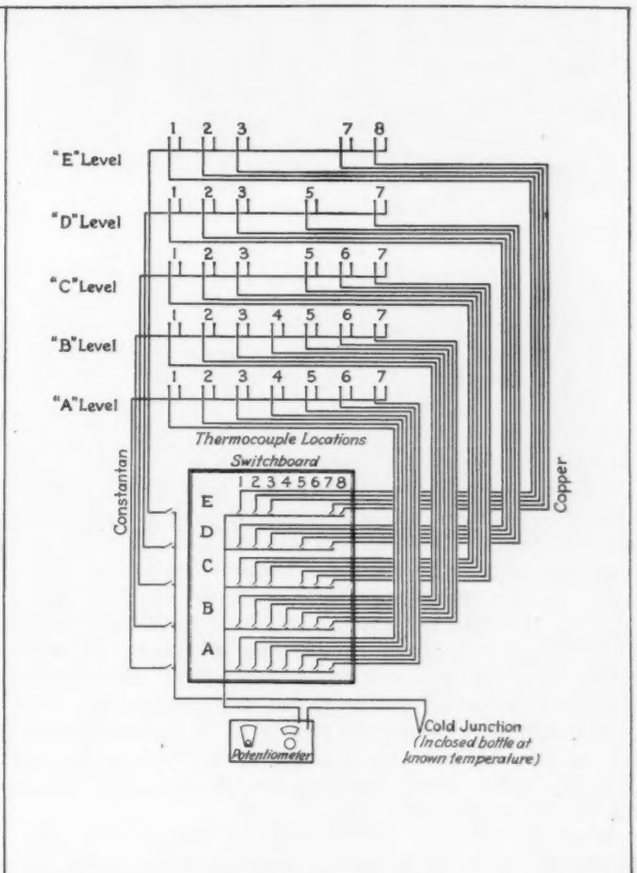


FIG. 2—WIRING DIAGRAM OF THERMOCOUPLE CIRCUITS

It has long been recognized that the stresses in the chimney shell due to temperature were of great importance, and theoretical analyses of these stresses, both circumferential and vertical, have been developed. The temperatures in the concrete of the chimney shell under operating conditions have not heretofore been measured. It has been necessary, therefore, to assume the difference in temperature in the concrete between the inner and outer faces of the chimney shell in order to use the formulas resulting from theoretical analyses. This indeterminate factor has prevented the application of measured (1) of the gases at the center of the chimney, (2) of the gases midway between the center and the chimney shell, (3) of the gases immediately adjacent to the chimney shell, (4) of the air (where the chimney was lined) between the lining and the concrete, (5) of the concrete approximately 2 in. from the inside of the shell, (6) of the concrete at the center of the shell and (7) of the concrete approximately 2 in. from the outside of the shell. It should be noted that in plotting and tabulating the results of the tests the readings are referred to throughout as numbered above, so that, for

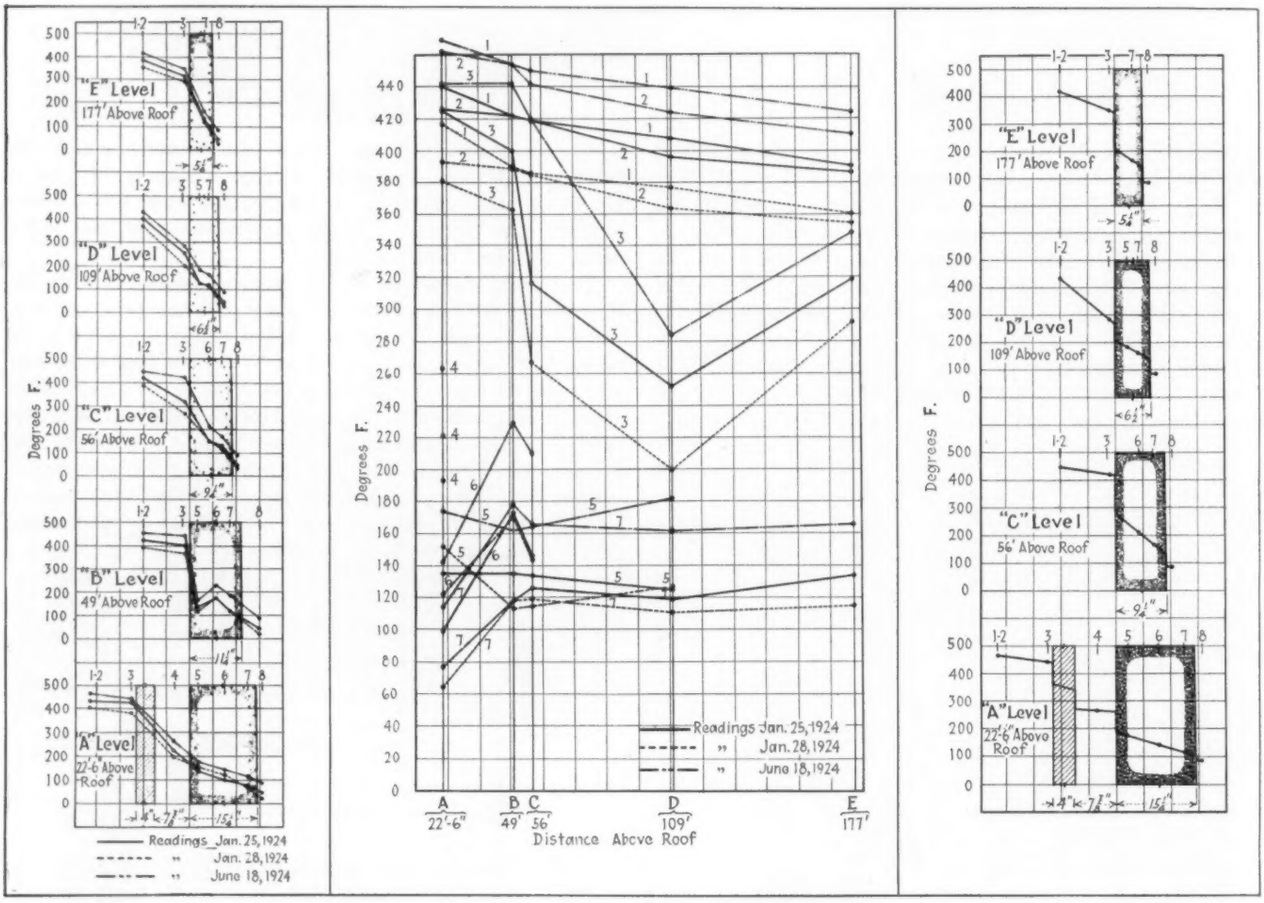


FIG 3 (LEFT)—TEMPERATURE READINGS ON RADIAL LINES THROUGH CHIMNEY SHELL. FIG. 4 (CENTER)—TEMPERATURE READINGS ON VERTICAL LINES PARALLEL TO SHAFT. FIG. 5 (RIGHT)—PROBABLE TEMPERATURE GRADIENT THROUGH SHELL

these formulas to the design of reinforced concrete chimneys with any degree of assurance.

At the suggestion of the Heine Chimney Company, Chicago, provision was made in the construction of a chimney for the New Bedford Gas & Edison Light Company, under the direction of Stone & Webster, Inc., for tests to determine the temperatures in the concrete of the chimney shell. The New Bedford Gas & Edison Light Company co-operated in every way and rendered much valuable assistance. The tests were planned and carried out by Stone & Webster, Inc.

The chimney selected for test is 15 ft. internal diameter at the top and 188 ft. high above its foundation, the foundation being superimposed on the steel framing of the station above the boilers.

When the chimney was constructed, sleeves were cast in the chimney shell at various levels as shown in Fig. 1, arranged so that at each level the temperatures could be

example, point 1 always refers to the temperature of the gas at the center of the chimney, point 5 the temperature of the concrete nearest the inside of the chimney shell, point 7 the temperature of the concrete nearest the outside of the chimney shell.

Readings were taken by means of copper-constantan thermocouples. Fig. 2 shows the wiring diagram for these couples, one couple being installed at each location so that readings could be taken at any point by merely closing the proper switch on the switchboard inside the power station. Couples in the gas stream were inserted through iron pipes to hold them in their proper location, the couple being insulated from the pipe. For readings in the concrete, small holes were drilled directly into the concrete, the "hot junction" of the thermocouple inserted and the entire sleeve filled solid with plaster of paris around the porcelain tubes that insulated the connecting wires. Independent copper

leads were run from each thermocouple to the potentiometer switchboard. Originally a single bare constantan wire was used, common to couples at all levels, but preliminary readings showed that this gave very inaccurate results. The single constantan wire was therefore removed and individual insulated constantan leads were run for the couples at each level, as indicated in Fig. 2. Readings were taken by a potentiometer in millivolts. The copper-constantan wire used was calibrated at the Massachusetts Institute of Technology and a table prepared from which the millivolt readings were converted to degrees Fahrenheit for plotting and tabulating the results of the tests.

In Fig. 3 the average of the three sets of afternoon readings on Jan. 25, the average of the two sets of readings on Jan. 28 and the readings of June 18 have been plotted from the center of the chimney to the outside at each level. It should be noted that the curves of this diagram do not represent the temperature gradient from the center of the chimney to the outside but are made up by merely plotting the observed temperature at the points where readings were taken and joining these points by straight lines.

It is a well-known fact that at the surface of a heat barrier there is a drop in temperature in the direction of the heat flow, so that at the inside of the chimney shell there is undoubtedly a considerable drop from the temperature of the gas impinging against the concrete to the temperature of the concrete itself at its inner surface. The probable character of the temperature gradient is illustrated in Fig. 5 with abrupt drops in temperature at the surfaces of the concrete rather than straight lines between observed points, although, of course, the exact nature of this curve is somewhat conjectural. This is not intended to indicate the actual temperature gradient but merely its character, as the curves of the diagram were plotted from a single set of readings.

The maximum stress due to temperature to be provided for in the design of the chimney is occasioned by the greatest difference in temperature in the concrete itself between its inner surface and the temperature reinforcement. The readings perhaps do not give this maximum condition of temperature difference in the concrete, which may occur on a very cold winter day when the boilers are first put on the line after being banked over a low station-load period. The hot gases impinging suddenly on the inner surfaces of the concrete may raise its temperature rapidly, the outer surfaces becoming warm gradually as the heat flows through the concrete, thereby giving a greater temperature difference and consequent greater stress. The wiring has been left in place to allow further data on this question to be obtained as opportunity permits in the future.

Maximum Drop Data

Tests of such limited nature cannot be taken as at all conclusive, and there are many unexplained variations in the observed readings. However, until further experimental data on this subject are available it is felt that for the purpose of designing reinforced concrete chimneys subject to conditions similar to those existing for the chimney under discussion the general trend of the test data warrants the conclusion that the maximum drop in temperature through the concrete of the chimney shell may be taken as:

a. Twenty degrees Fahrenheit per inch of shell thickness where the chimney is unlined.

b. Ten degrees Fahrenheit per inch of shell thickness where the chimney is lined so as to furnish insulation equivalent to that of the lining in the chimney tested.

It is hoped that these tests will lead to further tests along the same line and will result eventually in an accumulation of data from which still more positive conclusions can be drawn.

Mitigation of Electrolysis in Louisville

Installation of Drainage Bonds on Street Railway System of Louisville Gas & Electric Company Stops Electrolytic Corrosion of High-Voltage Underground Cable

By E. G. Norel*

THE two features of electrolysis migitation are (1) the reduction of the flow of current through the earth and metallic structures buried in the earth, (2) the reduction of anode areas of such structures to a minimum in order to reduce the area of destructive corrosion.

FIG. 1—CONDITION OF 15,000-VOLT CABLE AFTER REMOVAL OF WATER FROM MANHOLE

FIG. 2—SEVERE CASES OF PITTING ON 15,000-VOLT CABLE VISIBLE AS IT IS BEING REMOVED

In applying case 1 the usual procedure is to reduce the resistance of the legitimate path or increase the resistance of the underground structure. The former, which is always applied to a certain extent, is done by installing an extensive system of negative return feeders that are insulated from the earth and connected in parallel with the rails. The latter is done by inserting resistance joints at various points in the pipe lines.

For case 2 the anode area of the underground system is usually decreased by inserting at a predetermined

*Formerly of Louisville Gas & Electric Company

FIG. 3—CLOSE-UP OF A FAILURE IN THE CABLE

place a metallic bond from the rail or negative bus to the structure to be drained. This is usually called a drainage bond. Under the conditions that confronted the Louisville Gas & Electric Company it was most practicable to attempt the drainage system.

Early in April, 1925, it was discovered that the cable in the manhole at Campbell and Broadway, which is near the railway substation, was very badly pitted. The manhole had contained considerable water due to early spring rains and bad drainage. Upon pumping out the manhole and discovering the condition of the cable, the water and scale were analyzed and a survey was begun.

The scale was composed of sulphide and oxide of lead with some iron in very small amounts. The oxide of lead predominated. Sediment from water was composed mostly of sulphide of lead with considerable amount of iron, sand and dirt. The sulphide of lead predominated. The water was slightly acid to phenolphthalien indicator, and decidedly alkaline to methyl orange indicator. There was nothing in the water to produce the corrosion.

In making the survey of existing conditions readings were taken of potential difference between cable and rails, between earth and cable, between earth and rails, between water mains and cable and between gas mains and cable, direction and the amount of current flowing in the cable sheath and direction of current in the rails.

The results of the survey are shown in Fig. 1 and indicate that in places remote from the substation current was leaking onto the cable and in an area close to substation the current was leaving the cable and going back to the rails. The spot chosen for a drainage bond was at Campbell and Broadway, almost directly in front of the railway substation. A piece of No. 14 wire approximately 3 ft. long was soldered onto the cable sheath and the other end was connected to a 1,000,000-circ.-mil cable extending from the rail to the negative bus in the station. Limited drainage was desired, since the sheath current may be great enough to add unduly to the heating of the cable. As indicated in Fig. 1, the potential of the cable became everywhere negative to the rails, which was the desired result.

An additional survey was made in this area with respect to gas and water pipes. Although both gas and water mains are positive to the cable sheaths, the condition is not considered to be dangerous, since both gas and water pipes are connected to the negative bus through a drainage bond.

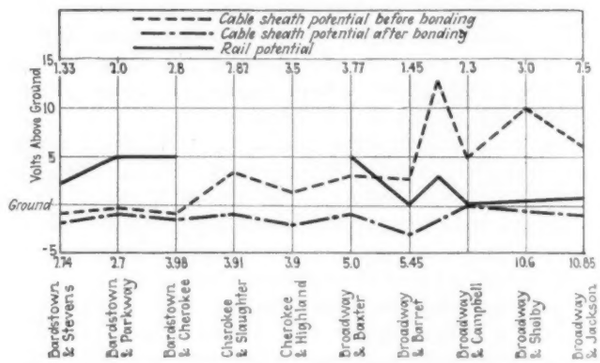


FIG. 5—ACTUAL VOLTAGE CONDITIONS IN EAST LOUISVILLE BEFORE AND AFTER BONDING

It is sometimes the practice where there are several substations to shut down certain of them during periods of the day when the load is small. This may cause a reversal of current in the bonds, thus providing a metallic conductor for current entering the cable sheath. An automatic switch has been developed that opens on reversal of current and consequently permits the current to flow in one direction only, from sheath to negative bus. It is the usual practice before approving a bond to place a shunt and a recording millivoltmeter in the circuit and thus determine the direction and the amount of current for all hours of the day. The smoke chart shown in Fig. 4 indicates that in the bond at Campbell and Broadway the current was always flowing from cable to negative bus.

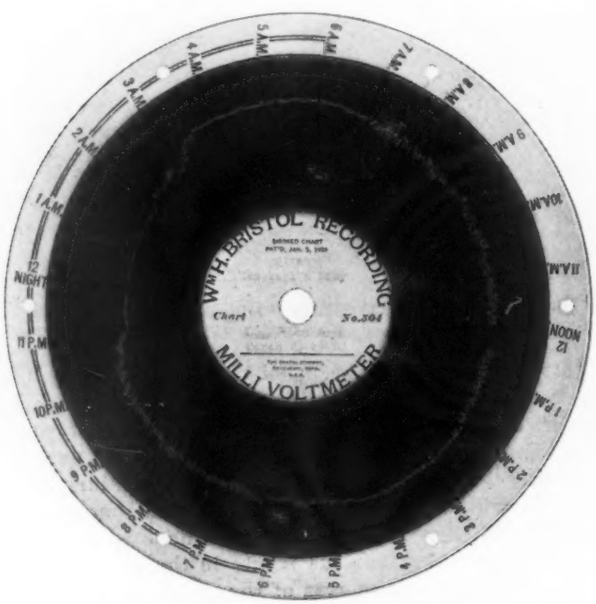


FIG. 4—A SMOKE CHART SHOWING DIRECTION AND AMOUNT OF CURRENT FLOW IN DRAINAGE BOND

"Getting Down to Cases in Electric Interconnection"

A BOOKLET with the above title, just prepared by Bonbright & Company, Inc., New York, tells about sixteen actual cases in which interconnection of plants has resulted in actual savings of dollars and cents, the particular cases being scattered throughout the country. In one case, for example, an investment of less than $25,000 saved power worth more than $100,000 annually; another $60,000 annually was saved through an investment of $150,000; in another the interconnection gave earning power to $1,250,000 worth of reserve equipment usually idle, and in still another instance a city of 32,000 avoided six days of darkness and idleness. These cases are typical of the many investigated.

Measuring Feeder End Pressures

Method Used by New York Edison Company to Measure Individual and Average Feeder End Pressures on a Three-Wire Direct-Current Network—May Be Used in Automatic Stations

By J. A. McHUGH and A. F. HAMDI
New York Edison Company

AS FAR as is known to the writers, companies operating Edison three-wire direct-current networks regulate system pressure in the following manner:

From a group of feeders connected to a given bus one feeder is selected as representing the average pressure characteristics of the group. The end pressure of this feeder is then maintained at a definite value selected to give the prescribed pressure at the customers' service. The assumption, therefore, is that as long as the end pressure of this so-called "standard feeder" is maintained at the proper value, all the other feeders connected to the same bus will supply proper pressure to their section of the network. The number of standard feeders in a station is determined by the number of direct-current buses operating at different pressures, one standard being selected for each bus. The end pressure of a standard feeder is continuously indicated by an indicating voltmeter and recorded by a graphic voltmeter as a matter of record. In order to insure that the average end pressures of all the feeders outgoing from a station are within the prescribed limit, it becomes necessary to observe at frequent intervals the end pressures of all the feeders and then to calculate the corresponding average end pressure.

In the larger distributing stations of the New York Edison Company, having as many as 136 feeders, pressure regulation by this scheme becomes quite an involved operating problem. Investigation was therefore made to find suitable means to enable the station operators to ascertain readily the average feeder end pressure at all times and to obtain a graphic record of the average end pressure of all the feeders outgoing from a direct-current distributing station. As a result of this investigation a method was jointly developed by the distributing stations and test departments of the New York Edison Company which makes it possible to average correctly the end pressures of any number of feeders on a single voltmeter.

The new method is based upon the principle that if two sets of star-connected leads of equal branch resistances are connected to several sources of potential difference, the potential difference between the common points is equal to (if the drop over the branch leads is negligible) the average potential difference of the various sources. In Fig. 1 $(E_1 + E_2 + E_3 + E_4 + E_5) \div 5 = E_{ab}$.

This principle was elaborated upon to meet the problem of indicating and recording the average end pressure of direct-current feeders emanating from the distributing stations of the company. The resistances shown in the various circuits are composed of two parts: (a) the resistance of the pilot wires running to the feeder ends inside the main cable, but insulated from it, and (b) the equalizer resistor. One purpose of the so-called "equalizer resistors" is to equalize approximately the resistance of the pilot-wire circuits from the feeder ends to the common point. If these branch resistances are not equal, the true average pressure cannot be obtained with the method herein described. A second purpose of the equalizer resistors is to minimize the amount of circulating current in the pilot-wire network resulting from unequal feeder end pressures.

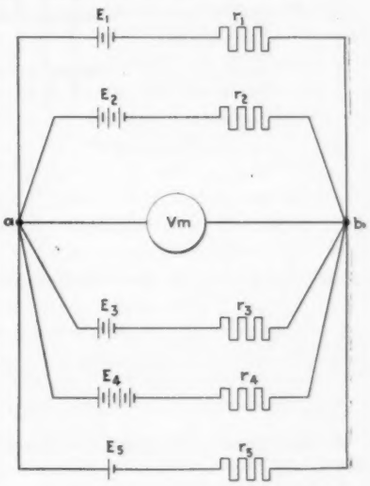


FIG. 1 — SIMPLE SCHEME FOR USING EQUALIZER RESISTORS TO OBTAIN AVERAGE END PRESSURES OF DIRECT-CURRENT FEEDERS

On the New York Edison Company system 100-ohm equalizer resistors are used, the resistance of the pilot wires being from 2 to 8 ohms. Accordingly the maximum variation in resistance of the pilot-wire circuits is not more than 6 per cent, which can be safely neglected.

This simple scheme can be successfully used only if voltmeters of high resistance (15,000 ohms on the 150-volt range) are used. If the voltmeters used have low resistance—in other words, have current of the order of 0.5 amp.—it does not give accurate enough indication as far as the measurement of individual feeder end pressures is concerned. In such cases it becomes necessary to disconnect from the pilot-wire network the pilot wire of the feeder the individual end pressure of which is being measured by the instrument.

In order to eliminate the difficulties mentioned above, two duplicate equalizer resistor networks are used by the New York Edison Company. One network is connected to the indicating voltmeters through a plug board for bus selection, whereas a second network is connected directly to the recording voltmeters. Double-pole, double-throw, push-button switches are employed to disconnect automatically the pilot wires of each feeder when its individual end pressure is being measured.

Fig. 2 shows in detail the application of the above scheme to the network of the New York Edison Company, where the following are some of the requirements:

1. Network voltage approximately 120-240.
2. Accuracy of all measurements must be within 0.5 volt.
3. Resistance of indicating voltmeters approximately 15,000 ohms.

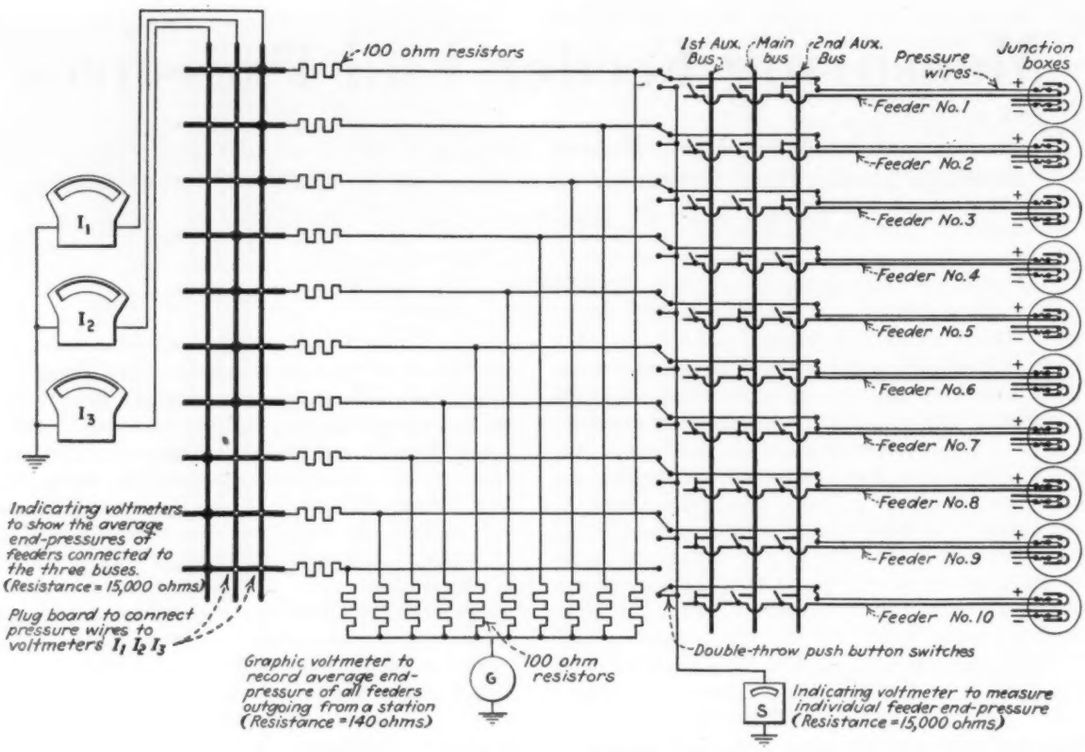

100 ohm resistors
1st Aux. Bus
Main bus
2nd Aux. Bus
Pressure wires
Junction boxes
Feeder No. 1
Feeder No. 2
Feeder No. 3
Feeder No. 4
Feeder No. 5
Feeder No. 6
Feeder No. 7
Feeder No. 8
Feeder No. 9
Feeder No. 10
I1
I2
I3
Indicating voltmeters to show the average end-pressures of feeders connected to the three buses. (Resistance = 15,000 ohms)
Plug board to connect pressure wires to voltmeters I1 I2 I3
Graphic voltmeter to record average end-pressure of all feeders outgoing from a station (Resistance = 140 ohms)
G
100 ohm resistors
Double-throw push button switches
S
Indicating voltmeter to measure individual feeder end-pressure (Resistance = 15,000 ohms)

FIG. 2—DIAGRAM OF CONNECTIONS FOR INDICATING AVERAGE AND INDIVIDUAL FEEDER END PRESSURES AND RECORDING AVERAGE FEEDER END PRESSURE IN AN EDISON NETWORK

The voltmeters and plug board are of a standard type. Double-throw push-button switches are of a special design to permit disconnecting of pressure wires from the resistors when individual feeder end pressures are being observed. They are arranged to control simultaneously the positive and negative pressure wires of each feeder so as to obtain simultaneous readings on two indicating voltmeters from the positive and negative sides to the grounded neutral. Only the positive side is shown.

4. Resistance of graphic voltmeters approximately 140 ohms.

5. Resistance of pressure wires ranging from 2 to 8 ohms according to the length of the various direct-current feeders.

6. The number of feeders in bus groups the end pressures of which are to be averaged ranging from 6 to 136.

7. One voltmeter (S) must be provided to indicate the individual end pressure of any one feeder outgoing from a station.

8. Three voltmeters (I_1, I_2, I_3) must be provided to indicate the average end pressure of the groups of feeders connected to the three buses.

9. One voltmeter (G) must be provided to record graphically the average end pressure of all feeders outgoing from a station.

To satisfy the above requirement, the following equipment was selected:

One hundred-ohm equalizer resistors in both pressure-wire networks.

Voltmeters of standard type such as used by the company for a number of years.

Plug board of standard make to permit suitable connection of pressure wires to the indicating voltmeter I_1, I_2 and I_3, according to bus set-up.

This equipment enables station operators to regulate correctly the average end pressure of feeders connected to the several buses in the station. If fewer than six feeders are connected to a bus, the equipment will not give the required accuracy of 0.5 volt, but averaging the pressure of a small number of feeders presents no serious problem. As long as the above condition is satisfied, the number of feeders connected to a given bus may be changed at will without impairing the accuracy of the regulating voltmeters I_1, I_2 and I_3. As a matter of fact, the accuracy of these voltmeters increases with the number of feeders the end pressures of which are averaged. The pressure of each bus is regulated according to the indication of the regulating voltmeters I_1, I_2 and I_3, all of which should be made to read alike. These three voltmeters are connected between the positive bus and the grounded neutral. No such regulating voltmeters are connected to the negative side, as operating conditions do not require them, pressure equalization being obtained, on this system automatically through compensating neutral connections to the static transformers of the synchronous converters.

The new equipment also furnishes a correct record of the average end pressures of all feeders outgoing from a given distributing station. In this case, however, graphic voltmeters G (one from the positive side to neutral and one from the negative side to neutral) must be specially calibrated for connection to a definite number of feeders, which must not be less than twenty, to obtain the desired accuracy of measurement. If this number is appreciably changed, recalibration of the recording voltmeters becomes necessary.

The accuracy of pressure regulation by means of a properly designed averaging equipment is limited only by the operators' care. All variations in average pressure are correctly indicated and recorded. The records are relatively free from momentary dips ordinarily caused by local mains troubles, which as a rule do not affect the average pressure of the network as a whole. The records so obtained, when periodically compared with customers' service pressure surveys, are of real value for determining the average pressure drop over the mains at various load conditions. It therefore becomes possible readily to establish correct feeder end-

pressure schedules, to give uniform customers' service pressure at all times.

The equipment described has been in service for about one year and has given very satisfactory results and has materially reduced the laboriousness of pressure regulation.

Tests also have been made which indicate that with this equipment load transfer between stations can be readily accomplished without affecting the network voltage. This is of particular importance in the case of loss of one or more units in a station, where the surrounding stations have ample capacity in reserve to pick up the load dropped by the station in trouble. Such tests would have been quite involved and would have required a considerable amount of time if the averaging equipment were not available, but the use of the pressure-averaging equipment rendered the modification of the average end pressure to any predetermined value extremely simple. Only such time was required as was necessary to operate the various regulators to the desired positions.

Can Be Used on Automatic Stations

This method can also be very advantageously used in automatic stations. When the contact-making voltmeters in such a station are actuated through an averaging network, the pressure regulation is not dependent upon the condition of a single pilot wire for correct operation. Where contact-making voltmeters are actuated by the pressure variations at the end of a single feeder, unnecessary switching on and off of machines usually results from local pressure fluctuations. Such unnecessary operations are effectively eliminated by the use of an averaging scheme, as the average pressure reflects the true network pressure condition and consequently the real need for change in the number of machines supplying the network.

Electrically Operated Doors

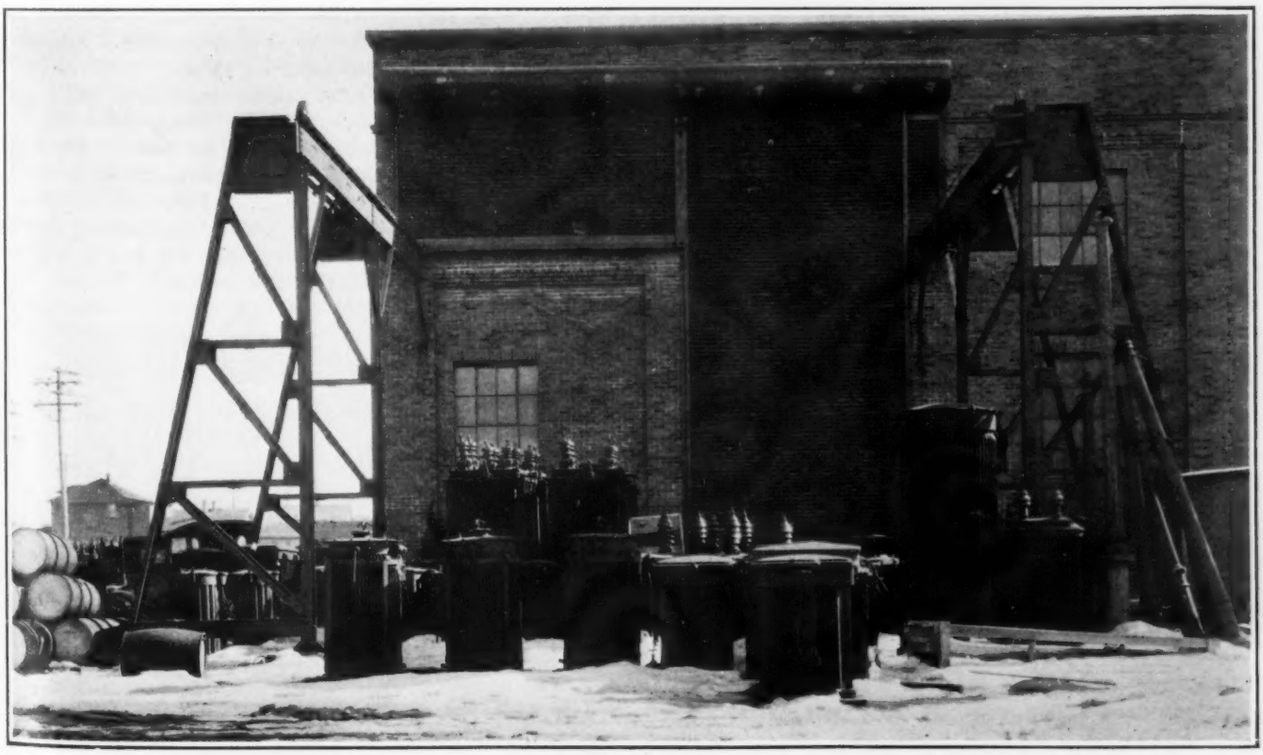
Rolling Steel Doors Raised with Motor Equipment —Thermostat Control for Fire Protection— Interlocking Operation Door and Pilaster

By J. F. Winn
J. G. Wilson Corporation, Norfolk, Va.

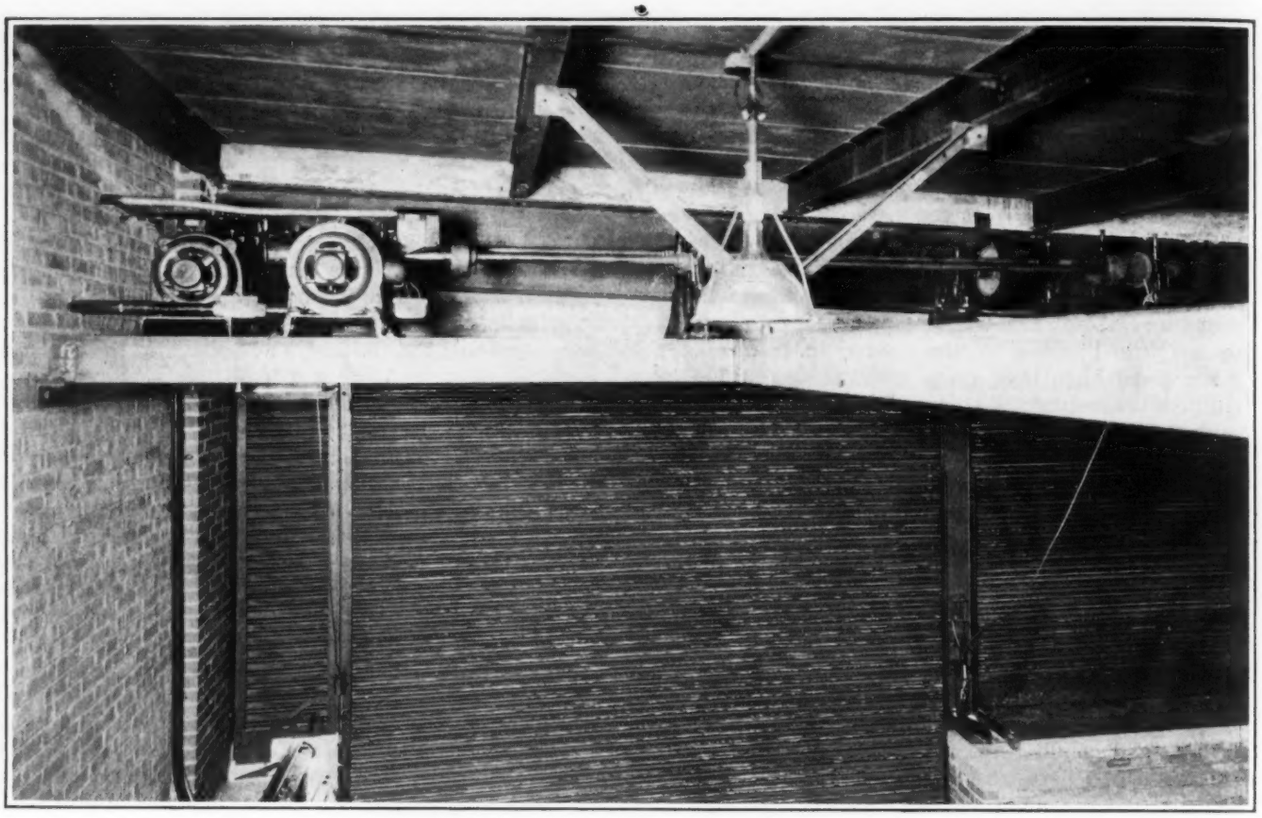
MOTOR-OPERATED rolling doors are becoming more popular every day as the logical method for rapidly closing small or large openings. The rolling steel door requires less space than any other type, is very rigid and has the added advantage of fire-resisting qualities.

Either alternating or direct current can be used for operating the electrical equipment. A standard alternating-current outfit consists of a magnetic reversing switch and relay, a push button, a solenoid brake, a limit switch and the necessary motors. A standard direct-current outfit differs only where motors of higher ratings than 3 hp. are necessary, when a special type of accelerating contactor is used. A thermostat may be connected with any control in order that the doors may be lowered automatically in case of fire.

Where installations occur that call for a series of very wide doors coiling upon a rigidly connected shaft, it is necessary to divide the doors by what is termed a movable pilaster. This is simply a structural steel shape of either channel or I-beam form to which are attached steel guides or grooves in which doors travel. When pilasters swing upward, being hinged at one end, an electric drive is also supplied similar to those furnished for operating doors. Thus it becomes evident that when doors and pilasters are to be raised in sequence, an electrical interlocking device is necessary to prevent the raising of pilasters when doors are down or lowering doors when pilasters are up.



CRANEWAY OPENING WITH MOTOR-OPERATED DOORS AND PILASTERS; INDIANA GAS & ELECTRIC COMPANY, FORT WAYNE

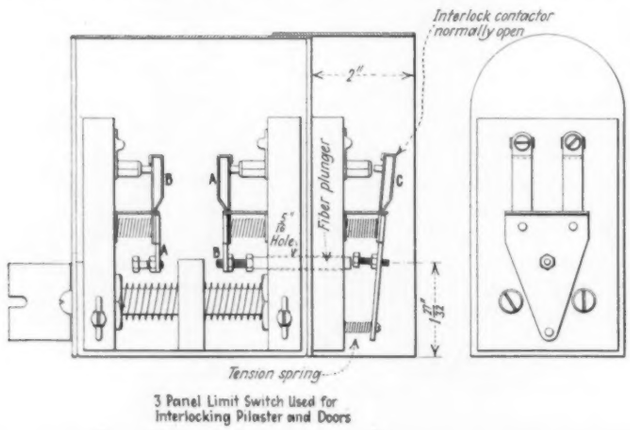


MOTORS AND CONTROL FOR OPERATING DOORS

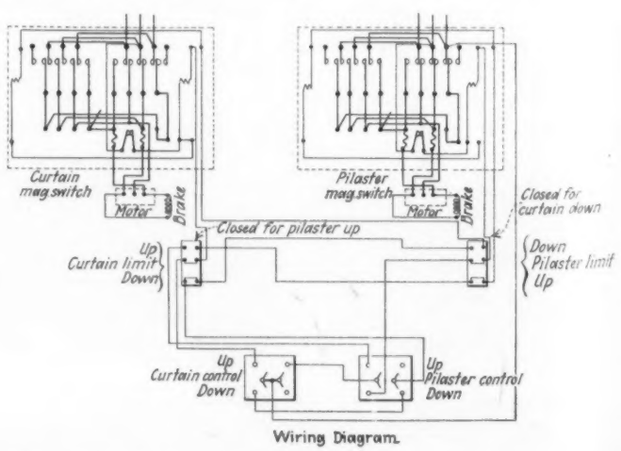
Such a device has been developed. This is a limit switch made up of one General Electric geared-type limit switch and half of another, connected together on a common base. The main worm shaft is connected directly to the reduction gear unit driving either doors or pilasters. Assuming the switch in the illustration to be connected to the door-raising unit, *B* is the lower limit of the doors, *A* is the upper limit and *C* is the pilaster interlock. When the doors reach their uppermost limit of travel, contact *A* breaks and contact *C* is made. The control circuit that raises the pilaster passes through contact *C*, which now, being closed, allows the pilaster to be raised. Unless the doors were fully raised, however, it would be impossible to raise the pilasters. The same type of switch is used on the pilaster unit, the interlock then being used to prevent lowering doors until pilasters have been lowered into place.

Why Publicly Owned Plants Fail

COMMENTING on reasons other than those of economic pressure that have caused a thousand municipal plants to go out of business in the last five years, Halford Erickson, vice-president H. N. Byllesby & Company, recently dwelt on the general dissatisfaction often aroused by political managership. "Efficient operation is often less important than votes," he said. "The result is that such plants are often badly constructed and poorly maintained. Extensions are frequently made for other reasons than because they are in line with good business and general public interest. The business or service is seldom fully and uniformly extended and developed. The prices charged for service are, as a rule, discriminatory and are levied without much regard for the cost of the service."



3 Panel Limit Switch Used for Interlocking Pilaster and Doors



Wiring Diagram

THREE-PANEL LIMIT SWITCH FOR INTERLOCKING CONTROL OF DOORS AND PILASTERS

System Cuts Utility Transportation Costs

Operating Expenses Lowered by Arranging for Maximum Use of Cars, Adoption of Taxicab Charge System, Standardization of Equipment, Making Repairs at Night and Keeping Analysis Records

By WILLIAM C. SHRIVER
Transportation Department, Dayton (Ohio) Power & Light Company

WITH very few exceptions central stations have neglected to give transportation problems proper valuation, looking upon the garage as a necessary evil to be passed over with little comment or attention. In many instances this attitude is chiefly responsible for the results obtained.

By handling its automobile transportation department in such a way as to get the maximum service from the fewest possible number of cars and trucks, charging car operation to the departments on a taxicab basis, standardization of equipment, conducting most repairs at night, and keeping records that facilitate analysis, the Dayton Power & Light Company has been able to operate its rolling stock at a very favorable unit cost.

Standardize on Few Makes and Types

Standardization of automatic equipment is necessary to obtain maximum efficiency of operation. The Dayton Power & Light Company uses only one make of car for ordinary passenger and light-delivery service, one make for the use of supervisors and heads of departments, and follows as closely as possible this system throughout heavier truck requirements. Under this plan the mechanics become exceptionally proficient on the makes used and the question of carrying adequate repair parts is simplified. Today under this system the men are turning out work in less time than the standard set by the manufacturers. The most important features of this plan consist of sending the report to the mechanics at frequent intervals and giving credit when credit is due. It is worth noting that it has been found expedient to limit the number of men working on one job or car at the same time. Approximately 90 per cent of the work can be taken care of best with only one mechanic on the job, and work requiring over two men is very rare.

Taxicab Charge

The "taxicab system" of operation has been in use by the Dayton Power & Light Company for more than six years. Those employees having constant need of a car are assigned one regularly, but those having only intermittent requirements for transportation, even though their demands average two or three calls per day, are not permitted to tie up a car in such service, but call on the garage for transportation as needed. By maintaining a number of unassigned cars, about 15 per cent of the entire fleet, intermittent work and emergency demands are satisfactorily taken care of with a minimum of equipment. Cars are charged to the departments on an hourly basis, each car having a time card similar to the employees' time cards, to be rung in and out by the drivers as the car is used. Since the department is charged for the car only during the time it is actually used by it, there is a tendency to release cars as soon as possible to lower the transportation charges. This condition still further increases the availability factor. The rates are based on the average cost of such cars over the preceding two years.

Night Mechanical Force

One of the big factors in obtaining economy of operation of the transportation department has been the use of a mechanical night force equivalent to the day force, enabling work to be done on cars without tying them up. Since, with the exception of executives' cars, all cars and trucks return to the garage for the night, the night force has an opportunity to take care of all minor repairs and a portion of the larger jobs without withdrawing the car from service. Practically all routine work, greasing and the like, is taken care of at night. Expensive cars are kept under the supervision of the transportation department because of the investment involved. This department insists on the mechanics doing the repair work on cars at a profit over standard rates of $1.25 per hour to support the repair department. Direct labor on cars is considered a direct measure of the indirect labor expense. Where direct labor is less than fifteen minutes on a car, it is charged to indirect labor.

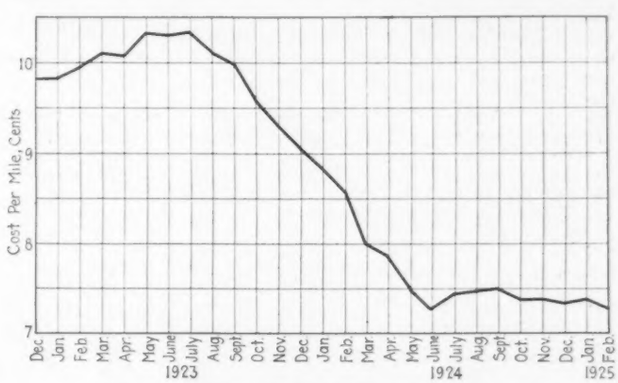


FIG. 1—UNIT COST OF OPERATING ALL CARS (MOVING ANNUAL TOTAL)

Spare front-end and rear-end units are built up for the lighter cars. Inactive car time due to repairs of this nature is reduced to a minimum, as the car is tied up only long enough to place the new unit. Repairs on the defective unit can then be handled at the convenience of the garage without interfering with the service in any way. It is not practical to make motor

Ford No. 99

Grind valves, clean carbon, flat rate	$10.00
Fit set of piston rings	
Smith, 7½ hrs. at $1.25 per hr	9.37

Ford No. 32

Grind valves, clean carbon, flat rate	3.75
Dowis, 3½ hrs. at $1.25 per hr	4.37

Ford No. 93

Grind valves, clean carbon, flat rate	3.75
Dowis, 3¼ hrs. at $1.25 per hr	4.06

Ford No. 34

Grind valves, clean carbon, repair ignition, adjust brakes, install one piston and ring	
Michael, 5¼ hrs.	
Hurley, ¾ hrs.	
6 hrs. at $1.25 per hr	7.81
Flat rate for grinding valves, cleaning carbon,	
Fit one piston and ring	6.50

Ford No. 94

Grind valves, clean carbon, fit rings on two cylinders	
Smith 6 hrs. at $1.25 per hr	7.50
Ford flat rate	6.50

FIG. 2—FORM OF REPORTS TO MECHANICS COMPARING TIME REQUIRED WITH ESTABLISHED TIME ALLOWANCE

Ford #

Every 500 miles.

Fill all grease cups and oil cups.

Fill fan hub. Clean and flush battery.

Inspect tire pressure. Inspect for loose rim lugs

Ford #

Every 1500 miles

Change oil and wash out crank case. A few drops of light motor oil on generator bearings.

Tighten all spring clip nuts and rear axle nuts.

Tighten spindle body bolts and line up front wheels.

Inspect grease in front hubs and rear axle.

FIG. 3—SAMPLE OF GREASING SCHEDULE INSTRUCTIONS

Itemized Garage Costs for One Month of All Cars Used by Dayton Company

Maintenance: *Material* includes repair parts, etc. *Labor*, all direct labor.

Tires: New casings and tubes, boots, tire protectors and cost of vulcanizing.

Fuel: Cost of gasoline.

Garage Operation: *Suptce. and Labor* includes supervisor, foreman, clerk, etc. (apportioned on basis of direct labor); *Other than Labor* includes light, heating, water, tools, etc. (apportioned on basis of number of cars.)

Total Cost of Operation: The sum of the above items.

Credit from Operation: Each car has an hourly earning rate which is based on cost of operation plus depreciation.

Period Plus or Minus: This represents difference between total *cost of operation* and *credit from operation* during period each car has been in service.

Car No.	Make	Repairs: Material	Repairs: Labor	Tires	Fuel	Garage Operation: Suptce. and Labor	Garage Operation: Other than Labor	Insurance	Total Cost of Operation	Credit from Operation	Period Plus or Minus	Mileage	Days in Oper.
89	Ford C Preb	$12.81	$1.00	$1.35	$17.95	$1.04	$2.42	....	$36.57	$93.00	$391.13	1,850	31
9	Ford 4D Sedan	20.61	4.88	14.17	5.48	5.07	1.21	$3.19	34.61	17.77	36.84—	462	6
16	Ford T. Car	24.45	11.95	15.64	8.37	12.42	2.42	....	75.25	58.65	8.45	1,236	20
25	Ford T. Car	4.53	3.38	.....	8.50	3.51	2.42	....	22.34	51.00	116.27	1,350	17
30	Ford T. Car	.75	2.51	.....	7.36	2.61	2.42	....	15.65	71.63	34.31	925	24
39	Ford T. Car	.27	.46	.....	1.59	.48	2.42	....	5.22	5.70	172.02—	114	2
92	Ford T. Car	3.78	4.12	.....	8.95	4.28	2.42	....	23.56	58.58	259.17	1.212	19
95	Ford T. Car	2.62	2.20	15.64	5.05	22.28	4.42	....	30.21	36.40	156.84	610	19
	Total Ford T	$36.40	$24.62	$31.28	$39.82	$25.58	$14.52	....	$172.22	$301.96	$403.02	5,447	101
21	Ford Roadster	$8.21	$12.06	$16.06	$12.41	$12.83	$2.42	....	$63.69	$72.88	$109.16	1,510	24
23	Ford Roadster	4.69	8.28	.....	9.52	8.61	2.42	....	33.52	64.50	167.76	1,082	22
26	Ford Roadster	5.36	6.74	30.03	10.62	7.01	2.42	....	62.38	68.03	39.46	1,251	23
27	Ford Roadster	12.36	6.86	2.61	9.09	7.13	2.42	....	40.47	66.00	19.43	1,290	22
28	Ford Roadster	2.48	7.35	8.87	5.77	7.64	2.42	....	34.53	67.73	304.68	687	23
32	Ford Roadster	6.94	6.45	.....	7.22	6.70	2.42	....	29.73	64.50	213.81	942	21
35	Ford Roadster	4.53	8.69	.....	5.77	9.03	2.42	....	30.44	61.58	49.16	967	21
46	Ford Roadster	4.20	6.79	.....	3.75	7.06	2.42	....	24.22	65.85	161.54	516	22
49	Ford Roadster	16.60	11.00	12.97	6.35	12.37	2.42	....	62.61	53.03	9.95—	1,020	18
50	Ford Roadster	36.62	9.89	.....	12.12	13.28	2.42	$1.67	73.00	59.18	14.41—	32,03	20
51	Ford Roadster	35.45	22.51	.....	14.29	23.09	2.42	1.67	99.23	80.33	18.90—	1,967	27
54	Ford Roadster	4.68	15.70	.....	10.39	16.32	2.42	....	49.48	76.95	306.23	1,538	26
56	Ford Roadster	10.58	12.88	10.55	8.08	13.38	2.42	....	57.89	72.30	190.53—	1,097	24
93	Ford Roadster	4.91	10.81	14.18	8.08	11.24	2.42	....	51.64	67.50	279.83	1,322	22
96	Ford Roadster	2.84	7.46	13.96	6.78	7.75	2.42	....	41.21	65.55	71.71	829	22
98	Ford Roadster*	5.62	1.25	4.70	8.84	1.30	2.42	....	24.13	45.00	66.80	806	15
99	Ford Roadster	9.89	7.81	.....	9.09	8.12	2.42	....	37.33	65.33	15.56	1,342	22
100	Ford Roadster	6.40	9.49	.....	9.96	9.86	2.42	....	38.13	70.35	65.33	1,301	23
	Total Ford Roadster	$182.33	$172.72	$113.93	$168.33	$179.42	$43.56	$3.34	$853.63	$1,186.39	$1,625.87	21,740	397
6	Ford L. D	$8.56	.....	$2.10	$21.17	.....	$2.42	....	$34.25	$85.95	$427.16	1,526	29
8	Ford L. D	6.11	$18.35	22.85	14.57	$19.05	2.42	....	83.33	89.18	157.36—	1,735	30
19	Ford L. D	26.87	27.79	20.79	15.01	28.89	2.42	....	121.77	77.25	23.99	1,898	26
20	Ford L. D	10.40	9.46	.....	10.82	9.23	2.42	....	42.93	62.50	131.06	1,300	28
22	Ford L. D.*	3.57	.....	.50	7.02	.....	2.42	....	13.81	39.30	467.70—	*	13
31	Ford L. D	13.20	.....	2.25	10.18	.....	2.42	....	28.03	34.00	687.75	834	28
36	Ford L. D	5.64	4.84	9.97	15.64	5.03	2.42	....	43.54	87.75	449.96	1,482	29
37	Ford L. D	6.82	13.24	1.89	8.08	13.76	2.42	....	46.21	41.78	47.21	795	14
38	Ford L. D	11.35	14.02	1.48	18.90	14.57	2.42	....	62.74	137.18	292.86	2,482	46
40	Ford L. D	6.55	3.76	.....	11.98	3.91	2.42	....	28.62	71.28	167.00	1,678	24
42	Ford L. D	56.67	19.44	2.75	5.48	20.21	2.42	....	106.97	58.13	161.02	532	19
43	Ford L. D	3.75	5.85	16.08	9.24	6.08	2.42	....	43.40	72.15	4.22—	1,420	24
48	Ford L. D	12.99	17.83	19.83	9.09	18.22	2.42	....	80.08	74.55	503.17	931	25
52	Ford L. D	57.10	26.25	27.93	13.42	27.29	2.42	....	154.41	70.13	43.84—	1,379	23
57	Ford L. D	5.82	2.29	.....	3.64	2.38	2.42	....	16.55	29.25	321.40	462	10
94	Ford L. D	67.24	28.06	21.36	6.35	29.17	2.42	....	154.50	46.20	12.44	795	15
	Total Ford L. D	$302.64	$190.85	$149.76	$180.59	$198.39	$38.72	....	$1,060.96	$1,146.55	$2,551.89	19,202	383
44	Ford 1-T. Cl. Tr. P	$7.89	$8.78	.....	$20.48	$9.13	$2.42	....	$48.70	$81.20	$927.53	843	20
45	Ford 1-T. Cl. Tr. W	42.42	2.70	3.75	18.69	2.81	2.42	....	72.79	99.50	339.16	1,117	25
90	Ford 1-T Cl. Tr. P	4.03	13.35	29.89	9.86	13.88	2.42	....	73.43	89.60	234.13	475	22
91	Ford 1-T. Cl. Tr	3.27	3.16	.75	5.48	3.30	2.42	....	18.40	52.70	111.11—	366	13
97	Ford 1-T. Cl. Tr. Preb	2.21	1.20	35.20	17.12	1.25	2.42	....	59.40	70.13	107.42—	961	23
	Total Ford 1-T. Tr	$59.82	$29.21	$69.39	$71.63	$30.37	$12.10	....	$272.72	$393.13	$1,282.31	3,762	103

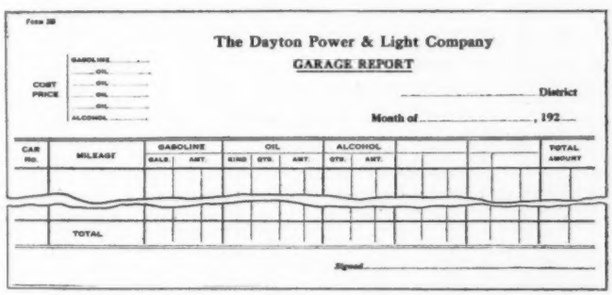
replacements on this basis, as state registration laws then come into play and much red tape is required.

Tire attention, battery attention and the filling with gas, oil and water are taken care of at night. Only well-worn tires are used as spares, mounted on rims painted bright red. An inspection is made of each car every night and the presence of a red rim on a wheel is readily spotted, giving notice of the necessity for tire work.

A greasing schedule based on mileage and closely conforming to the recommendation of the manufacturer is in force.

DRIVER RESPONSIBILITY

One of the most annoying problems to be faced in transportation operation is the question of driver responsibility. With the exception of the drivers of the few unassigned trucks the operators do not come under the supervision of the transportation department. The trouble due to careless driving frequently does not come to the surface until long after the cause has occurred, making it difficult to place responsibility definitely. However, a reckless, careless driver or one addicted to excessive speed can be detected by closely


Form 30

The Dayton Power & Light Company

GARAGE REPORT

GASOLINE ....
OIL ....
OIL ....
OIL ....
ALCOHOL ....

COST PRICE

District

Month of ....., 192..

CAR NO.	MILEAGE	GASOLINE GALS.	GASOLINE AMT.	OIL KIND	OIL QTS.	OIL AMT.	ALCOHOL QTS.	ALCOHOL AMT.			TOTAL AMOUNT
TOTAL											

Signed .....

FIG. 4—GASOLINE AND OIL MILEAGE WATCHED CAREFULLY

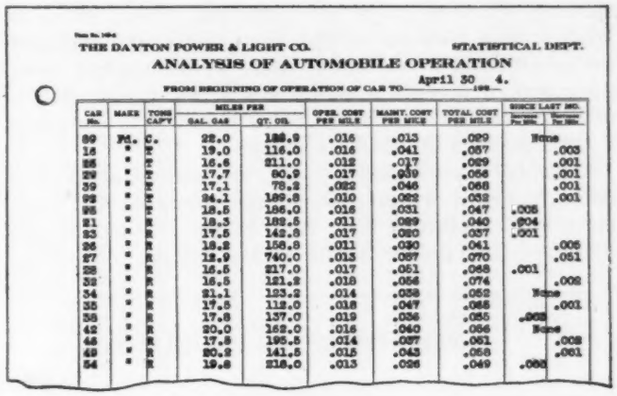
This form is filled out monthly by the clerk in the transportation department from his daily consumption reports. It is then sent to the auditing and statistical departments.

watching the type of repairs necessary on his car, and when the garage supervisor is able to gather sufficient evidence of this nature the driver is ruled off. Spring breakage is one of the most conclusive evidences of poor driving. One of our most careful drivers now has a record of more than four years' operation, driving more than 50,000 miles without spring breakage, while at various times other drivers have broken springs on an average of every 2,000 miles during the short time they were permitted to operate cars.

On the body of every car the Dayton Power & Light Company has placed a sign "I AM DRIVING CAREFULLY, ARE YOU?" The presence of this sign has had a good effect on the drivers and the public seems to accept it as a standing invitation to report any instance of reckless operation. The results are more than satisfactory.

CUMULATIVE COST RECORDS

Too much stress cannot be placed on the necessity for an accurate and comprehensive record system covering in detail all activities of the transportation department. By means of these statistical records the manager or superintendent is kept closely in touch with the results and all employees are kept on their toes to show improvement. It is also important that the records reach the garage supervisor promptly, as a report covering work weeks or months old is by no means as effective as up-to-the-minute information.


Form No. 1004

THE DAYTON POWER & LIGHT CO. STATISTICAL DEPT.

ANALYSIS OF AUTOMOBILE OPERATION

FROM BEGINNING OF OPERATION OF CAR TO April 30 4.

CAR No.	MAKE	TONS CAPY.	MILES PER GAL. GAS	MILES PER QT. OIL	OPER. COST PER MILE	MAINT. COST PER MILE	TOTAL COST PER MILE	SINCE LAST INV. Increase Per Mile	SINCE LAST INV. Decrease Per Mile
89	Ft.	C.	22.0	188.8	.016	.013	.029		None
14	"	T	19.0	116.0	.016	.041	.057		.003
86	"	T	16.6	211.0	.012	.017	.029		.001
29	"	T	17.7	80.9	.017	.039	.056		.001
39	"	T	17.1	78.2	.022	.046	.068		.001
92	"	T	24.1	189.8	.010	.022	.032		.001
96	"	T	18.5	186.0	.016	.031	.047	.008	
21	"	R	19.5	182.5	.011	.029	.040	.004	
33	"	R	17.5	142.8	.017	.020	.037	.001	
26	"	R	18.2	158.8	.011	.030	.041		.005
27	"	R	12.9	740.0	.013	.057	.070		.051
28	"	R	16.5	217.0	.017	.051	.068	.001	
32	"	R	16.5	121.2	.018	.056	.074		.002
34	"	R	21.1	133.2	.014	.038	.052		None
35	"	R	17.5	112.0	.018	.047	.065		.001
38	"	R	17.8	137.0	.019	.036	.055	.002	
42	"	R	20.0	162.0	.016	.040	.056		None
46	"	R	17.5	195.5	.014	.037	.051		.002
49	"	R	20.2	141.5	.015	.043	.058		.001
54	"	R	19.8	218.0	.013	.026	.049	.003	

FIG. 5—CUMULATIVE ANALYSIS OF CARE IN PERFORMANCE (PARTIAL REPORT)

The control data are in the two right-hand columns. Prepared by the statistical department.

Lack of a standardized system of records makes it difficult to compare the operation of the transportation department of one company with another. Cumulative records on each car are the only means of determining and segregating the various factors of operation and maintenance costs. Cumulative costs get the message across to the drivers and mechanics and establish among them a spirit of rivalry that produces best results. Proper study of these records has enabled the Dayton Power & Light Company to reduce the average cost per mile for all cars from 10.4 cents per mile in 1923 to 7.4 cents in 1924, and there is every indication that this figure will go still lower.

Detailed operating expenses of the rolling stock have been kept since the beginning of 1922.

These records permit analysis of performance, but are not the cause of results. They do help, however, in determining when to turn in cars. All labor, materials, gas, oil and controllable expenses are included, but depreciation or interest on investment is not. About ten types of cars are used and are driven approximately 1,000 miles a month on the average. At the rate at which Ford touring cars are driven 1 cent per mile could be charged off for depreciation equitably. As a

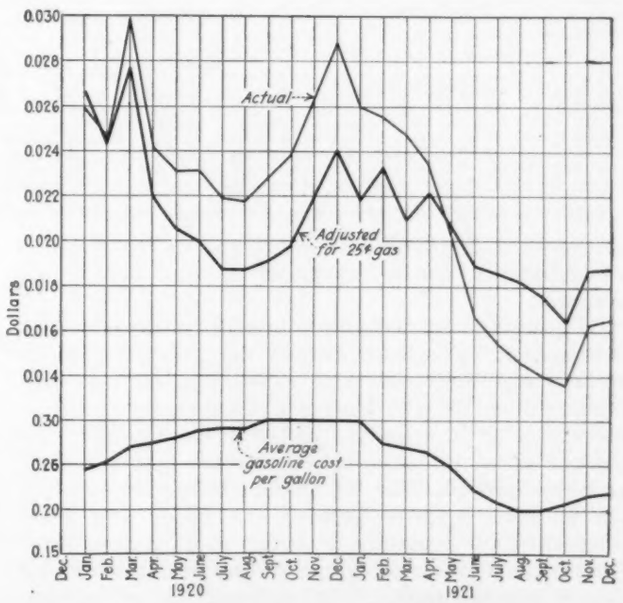
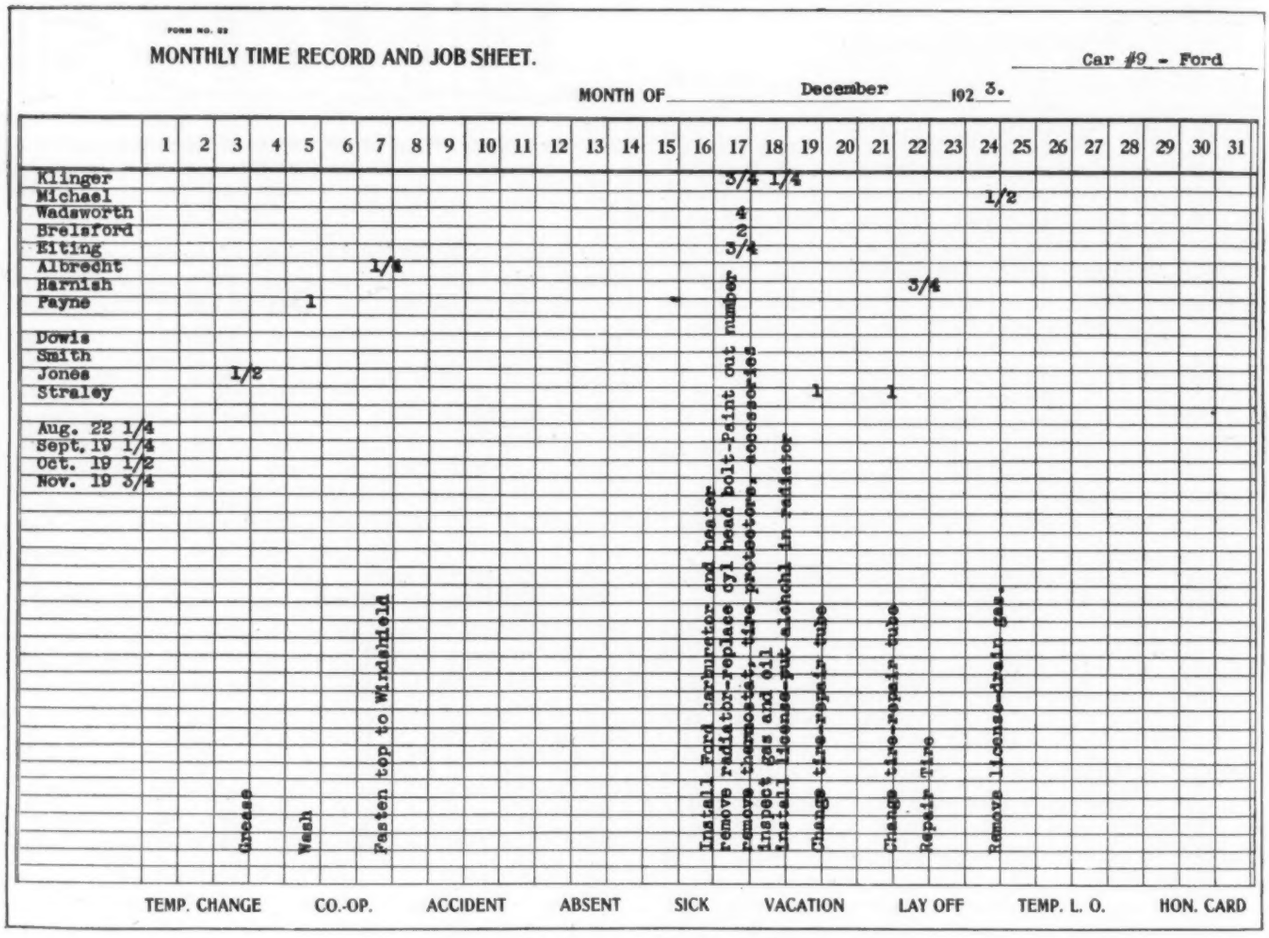


FIG. 6—GASOLINE COST PER MILE (LIGHT FORDS)

warning when to study the individual record more in detail with a view to turning in the cars, the company has established a maximum limit of economical operating cost of 5 cents a mile. When the operating cost on Fords rises 1 cent beyond this point, it is advisable to turn them in, it has been found.

A garage record system, accurate and detailed, is a major factor in bringing about improvements and holding ground gained. Cost records for the month are completed and in the hands of the garage supervisor by the tenth of the following month. By the fifteenth all statistical records dependent on cost figures are available.


FORM NO. 22

MONTHLY TIME RECORD AND JOB SHEET.

Car #9 - Ford

MONTH OF December 192 3.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Klinger																	3/4	1/4						1/2						
Michael																															
Wadsworth																	4														
Brelsford																	2														
Eiting																	3/4														
Albrecht							1/8																								
Harnish																						3/4									
Payne					1												number														
Dowis																															
Smith																															
Jones			1/2																												
Straley																			1		1										
Aug. 22 1/4																															
Sept. 19 1/4																															
Oct. 19 1/2																															
Nov. 19 3/4																															

Install Ford carburetor and heater
remove radiator-replace cyl head bolt-Paint cut
remove thermostat, tire protectors, accessories
inspect gas and oil
Install license-put alcohol in radiator
Change tire-repair tube
Change tire-repair tube
Repair Tire
Remove license-drain gas.
Grease
Wash
Fasten top to Windshield

TEMP. CHANGE | CO.-OP. | ACCIDENT | ABSENT | SICK | VACATION | LAY OFF | TEMP. L. O. | HON. CARD

FIG. 7—GARAGE TIME RECORD AND JOB SHEET

A monthly sheet for each car on which is recorded, by days, the time (in hours) put in by the various mechanics, greasers, washers, etc. The nature of the work done is indicated by the memo accompanying each time entry. A summary of total man-hours devoted to car repairs during the preceding months is shown in the left-hand margin, under the names of workmen. A glance at this sheet by the supervisor will at any time disclose the kind of repairs made and time consumed. A cost check for the car can easily be made by applying the respective rates to total. Frequently comparisons of job costs with standard job costs as established by the Ford company enables very effective control of this work. The posting of the time to this sheet from the daily time sheets is done by the night telephone operator, who usually has plenty of time to do the work.

Gasoline and oil mileage is closely watched. With thermostatic carburetor control the average gasoline mileage has been improved more than 40 per cent, ranging from 15 to 16 miles per gallon on Fords during the winter to 20 miles per gallon in the summer. By the use of an oil gage the oil mileage has also been greatly improved. The Ford manual suggests carrying the oil level midway between the upper and lower petcocks. It is necessary to install an oil gage of some type to enable the man filling to determine the oil level quickly and accurately. Improvement in oil mileage has reached the point of maintaining an average of slightly more than 100 miles per quart of oil consumed.

The purchase of gasoline in carload lots instead of tank-wagon delivery has reduced the cost of gasoline by 40 per cent. The storage tanks and facilities for handling gasoline in this quantity were paid for by the profits accruing from this method of purchasing in less than six months and have been earning a handsome profit ever since. Gas is stored in two 6,000-gal. tanks, the oil being stored in two 300-gal. tanks. All gas is ethylized, as it has been found that this not only increases the mileage per gallon but reduces the amount of maintenance.

Proper housing, efficient lighting and adequate tools are other essentials for economical operation. The company recently erected a modern service building centralizing all operating departments and gave much attention to proper garage facilities. This factor has unquestionably lowered our costs. The shop was equipped with labor-saving devices and in turn the mechanics were required to have sufficient hand tools. The parts stock room is operated by the stores department and does not come under the supervision of the transportation department.

The following accessories are standard equipment on Fords: odometer, bumper, windshield wiper, oil gage,

thermostatic carburetor control; and on a few cars working at night a spotlight is included. Additional equipment as a rule means additional trouble far out of proportion to the benefits derived.

New Method of Spot Welding

Pin-Type Welding Is Developed to Meet Need for Improvement Over Riveted and Spot-Welded Joints

By Ralph G. Hudson
Associate Professor of Electrical Engineering, Massachusetts Institute of Technology

THE attachment of a thick metal to a thin sheet may be accomplished by riveting or by some form of "point" or "ridge" spot welding. When the riveting method is employed, the breaking strength of the joint depends to a considerable degree upon the diameter of the head of the rivet. If the surface of the thin sheet is to be finished smooth, the hole in the sheet must be countersunk, and since the depth of the countersink may be only a few hundredths of an inch, the strength of the joint is insufficient for many applications.

In applying the spot-welding method to the same problem the surface of the thick metal must be upset with points or ridges. The production of uniform projections is accomplished in many cases with difficulty and expense. Moreover, the welding of a thick metal to a thin sheet by any process is attended by an uneven heating of the respective members by reason of the tendency of the thick member to become heated more slowly than the thin member. When the spot welding is accomplished by joining each projection consecutively, the strength of each new joint becomes less than that of the preceding one owing to the low-resistance shunt produced by the completed welds, which serves to divert the current from the point or ridge about to be fused.

While making a study of a possible improvement in the method of attaching the handle of a mason's trowel to the blade, the writer devised a new method of spot-welding, called pin-type welding. Since the method has many applications to other manufacturing operations, the process is described with regard to its general adaptation.

A piece of bar stock, $\frac{3}{8}$x$\frac{1}{2}$ in. and 12 in. long, is to be attached to a piece of sheet steel of No. 22 gage

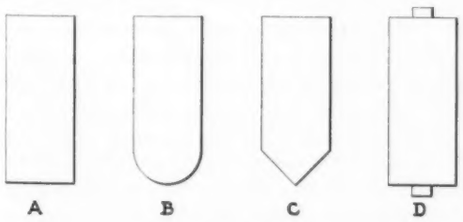


FIG. 1—WELD PINS

0.03125 in. thick and about 6 in. wide by 15 in. long. The bar stock contains 0.2 per cent carbon and the sheet steel 0.8 per cent carbon. Holes $\frac{13}{64}$ in. in diameter and spaced 1 in. on centers are drilled through the bar along the center line of its $\frac{1}{2}$-in. sides. Pins $\frac{1}{2}$ in. in length are cut from $\frac{5}{16}$-in. arc-welding rod of 0.06 per cent carbon content.

The success of the method depends principally upon the shape of the ends of the pins. Four shapes have been experimented with, as shown in Fig. 1. Pin shapes *A*, *B* and *C* were all found to be undesirable. The best shape is that shown in *D*.

The current, the time of application and the mechanical pressure on the pin will vary widely with the dimensions of the members to be welded. In the case illustrated, with a potential of 1.6 volts between the electrodes, the best weld was obtained with a current of 6,500 amp. applied for three seconds with a mechanical pressure of 11,500 lb. per square inch on the pin.

Microphotographs of various cross-sections of the weld disclosed no evidence of burning and a negligible

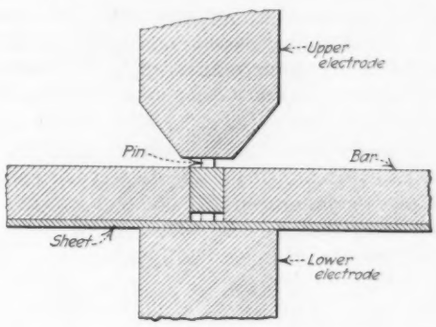


FIG. 2—WELDING MECHANISM SET UP

amount of martensite. The welds are therefore comparatively free from brittleness. Direct tension tests of a large number of specimens gave an average strength of 350 lb. Several riveted specimens were made, using the same bar stock and sheet steel. The average strength of the riveted joints was 92 lb. The average strength of a welded joint is therefore nearly four times as great as that of a riveted joint.

Reason for Effectiveness

The effectiveness of the process and its superiority over other welding methods is due first to the fact that the oxide on the pin permits little diversion of the current from the point of contact with the thin sheet. The effect of the burr on the bottom of the pin is to cause the sheet and the burr to fuse at approximately the same instant. The effect of the burr on the top of the pin is to cause the upper end of the pin to fuse early in the process so that it will become squashed or headed over under pressure in a manner similar to that of riveting.

Although the pin is slightly smaller in diameter than the hole, the body of the pin reaches a sufficient temperature to become plastic under the pressure and forms a mechanical union with the bar. In no case was any tendency indicated for the pins to be pulled out of the holes or loosened in any way.

The critical conditions stated in the example cited were obtained by F. W. Gilmore and H. J. Ryan in their bachelor's thesis (1926) at the Massachusetts Institute of Technology. From the data given it will be possible to anticipate the changes in the critical constants which must be applied to other cases. Higher values of all constants may be employed if the sheet is of lower carbon content. It may also be noted that the method is applicable to work of any thickness or shape and may prove desirable for metals of great thickness where ordinary spot-welding methods prove unsatisfactory in results obtained.

Letters from Our Readers

Central System of Public Service Company of Colorado Had Rating of 65,100 Kva.

To the Editor of the ELECTRICAL WORLD:

We were very much disappointed to note from the table on page 13 of the July 3 issue of the ELECTRICAL WORLD that you did not credit Colorado with any systems of 50,000 kva. or over. Perhaps you will be interested in the following data of this company.

The central system, comprising the interconnected districts of the Public Service Company of Colorado, has connected to it power plants of the following kva. ratings: Valmont, 25,000; Shoshone, 12,500; Boulder Canyon, 12,500; Georgetown, 1,000; West Station, 6,000; Lacombe Station, 1,600; Lafayette, 6,500.

This makes a total rating of 65,100 kva. The above-mentioned plants generated 235,000,000 kw.-hr. in the year 1925. The system peak was 58,000 kw. There are, in addition to the central system, six isolated properties, totaling 8,000 kw. H. H. KERR,

Denver, Col. Superintendent Electric Department.

Looks to Utility for Service

To the Editor of the ELECTRICAL WORLD:

Your editorial in the Aug. 7 issue of the ELECTRICAL WORLD, on "Knowledge and Organization Needed in Domestic Refrigeration" is timely and interesting, but, to the writer's way of thinking, requires elaboration.

The writer paid $5.50 for less than 30 minutes' "service" on his "Kelvinator," which had been purchased and installed within the year. It came about in this way: Ice advertising emphasized the high maintenance costs of mechanical refrigeration, featuring the expense of the inspection and servicing of the devices. There was nothing wrong with our unit, but for the purpose of checking I asked the Kelvinator people to have the next man who was in the neighborhood call and service our unit. A man was sent from Philadelphia to Swarthmore, about 12 miles. He found nothing wrong with the machine, but he dusted it off and left. A bill for $5.50 was the result, which proved that the contention of the ice people is justified.

In our home we have an oil heater which operates electrically, also an electric washer, a vacuum cleaner—in fact, virtually all of the electric work-saving devices which we all know add to the income of the utility companies. A couple of week ago the laundress blew the fuse when connecting up the washer. Our local power company replaced the fuse and at the same time reported to the laundress that the connecting socket was defective, but the man was not permitted to make repairs to that. This made it necessary to hold up the work until an electrician could be found who would be willing to spend his time on a very small job.

The "Oil-O-Matic" people, whose burner we installed, want $25 the season, under contract, for servicing the heater.

Is it not time that public utility companies established qualified servicing departments through which users of these devices could have them kept in good working condition at moderate cost? You can easily see that while every implement in use in my own home is working perfectly, and likely to, I cannot recommend any of them to others, because of a needlessly excessive upkeep. There is little that is complicated in these devices—practically all are driven by small motors, and repairs can be made by almost any man of mechanical aptitude; but they are entirely operated by women. Do you not agree that the utilities companies have the largest interest in keeping them in satisfactory working condition? FREDERICK CARLES.

Rapid Development of the Electrical Industry in Italy

EXTENSION of the electrical industry in Italy was accelerated by the interruption of coal imports from 1915 to 1918. While in 1898 the fuel consumption amounted only to about 5,000,000 tons, of which 90 per cent had to be imported, it reached in 1914, the last year before the war, 12,000,000 tons. It is true that at the end of the last century there existed numerous electric generating stations in Italy, the capacity of which surpassed 100,000 hp., reaching 1,300,000 hp. by 1914. However, the steam power produced before the war could not be immediately supplanted by electricity. Under the pressure of the rapidly increasing demand numerous power stations were constructed and the present output of electrical energy saves the country annually at least 2,500,000,000 lire which would otherwise have to be spent for the importation of coal.

Hydraulic conditions are responsible for the fact that the largest electrical enterprises of Italy are to be found in Liguria, Piedmont, Lombardy and Veneto. In other regions of the peninsula there are quite a number of central stations, but most of them offer less constant power possibilities. The largest power-station groups are in the north, their energy sources being the Alpine rivers. Starting from the most southerly spur of the Alps, the Ligurian Mountains, the principal groups are situated in a semicircle around the plain of the Po River; to the south there join the groups of the Emiglia, Romagna, Toscana, Umbria and up to the island of Sicily.

The stations of Italy in 1925 generated in all 7,600,000,000 kw.-hr., only 300,000,000 kw.-hr. of which was produced by steam. Had it been necessary to produce it all by steam, 10,000,000 tons of coal would have had to be imported. This figure alone shows the great importance of hydro-electricity to Italy. The production of some of the largest plants in kilowatt-hours was as follows: Società Idroelettrica Piemonte, 1,300,000,000; Società Adriatica di Elettricita, 506,000,000; Società Ligure-Toscana di Elettricita, 140,000,000; Società Meridionale di Elettricita, 217,000,000.

The consumption of electrical energy increased in Italy from 2,400,000,000 kw.-hr. in 1914 to over 7,500,000,000 kw.-hr. in 1925. This is an average consumption for the whole of Italy of 185 kw.-hr. per capita. In the industrial north the figure reaches 400 kw.-hr. to 500 kw.-hr., which compares with 600 kw.-hr. to 700 kw.-hr. in Switzerland.

The following financial data on the most important Italian power plants may be of interest:

	Stock Issued	Reserves	Indebtedness
	(In million lire)		
Societa Idroelettrica Piemonte	600	83.6	712.8
Societa Generale Italiana, Edison	360	45.5	568.9
Societa Adriatica di Elettricita	200	6.6	123.4
Societa Meridionale Napoli	180	2.4	100.9
Societa Generale die Elettricita della Sicilia	120	1.9	161.2

Central Station and Industrial Practice

Design Steam Turbine for Change in Operating Conditions

A STEAM turbine that can be used with relatively low steam pressure and temperature in a present station but that with slight changes can be used with steam of high pressure and temperature when the station is modernized is being obtained by the Trinidad Electric Transmission, Railway & Gas Company of Trinidad, Col., which supplies power to most of the coal mines in the southern Colorado fields around Walsenburg and Trinidad.

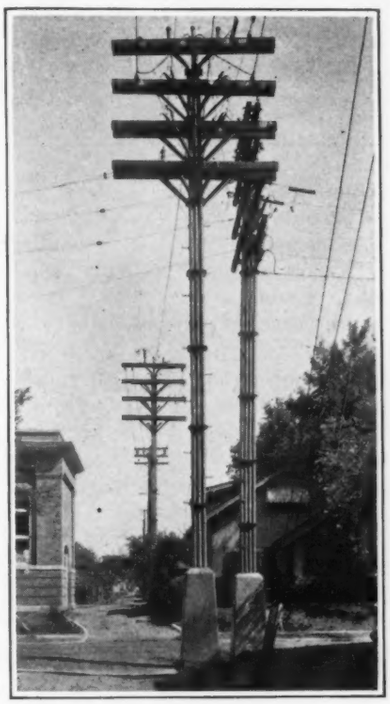
In the Trinidad plant there is a 5,000-kw. steam turbo-generator set; the Walsenburg plant is at present of smaller capacity. The power demand made it necessary to add to the equipment of the Walsenburg station, which is an old plant with low steam pressure and superheat. The company is looking forward to the day when it will put in new boilers, raising the steam pressure and temperature to a point that will give the economy of a modern plant. Inquiry was therefore made for a machine that could be used at present on 165-lb. steam pressure and 100 deg. superheat and that with minimum modification could at a later date be used on a pressure of 350 lb. or more and a total steam temperature of 700 deg. F.

A 6,000-kw. steam turbine meeting these specifications is now being built at the Lynn works of the General Electric Company. The unit is laid out with all high-pressure parts suitable for the maximum steam temperature and pressure, and provision is made for eventually mounting fourteen wheels; however, as first installed for the lower steam pressure it will have nine wheels, and the first-stage nozzle and buckets will be suitable for the lower pressure. The five wheels originally omitted, together with high-pressure nozzles, will be shipped along with the turbine.

When the plant is rebuilt for 550-lb. steam pressure, it will merely be necessary to place the extra five wheels and high-pressure nozzles in the turbine. In this way the Trinidad company will secure the benefits of maximum economy of operation under both present and future steam conditions.

Bunched-Conduit Pole Serves Dual Function

A CONGESTED mass of overhead circuits radiating from a substation in a residence district is frequently unsightly. A mass of underground conduit running up poles to overhead conductors is a little less conspicuous. Complete underground service is usually too expensive for the load densities obtained in most residential districts.



CONDUIT POLE FORMS UNDERGROUND-OVERHEAD CONNECTION

Most of the overhead wires have been removed on these particular poles because they served old series arc circuits that have been cut over to multiple incandescent circuits.

To provide the most sightly connection between one of its residence-district substations and overhead circuits the Minneapolis General Electric Company brought the circuits out through underground conduits to the curb line, where they were extended vertically and clamped together in the form of a pole. The conduits terminate at the top in pot-heads, to which the overhead circuits are connected.

Some Dispatching Methods in Wisconsin

ACCORDING to O. M. Ward, assistant electrical engineer in charge of operation, the Milwaukee Electric Railway & Light Company, numbers are used to facilitate switching orders on its system. Generally speaking, switches that are located in power plants and substations carry the same number as the line to which these switches are connected. Other switches, such as pole-top switches, that are not located in a power plant or substation, are numbered, but may not have the same number as the line in which they are connected. These switches are identified by any number that it appears advisable to give them.

The identifying number for lines indicates the voltage of the circuit and the substation or power plant from which the line normally feeds. It is the practice to allot 100 numbers for each power plant or substation. That is, if a new substation is added to the system, for instance, all of the feeders and lines leaving this substation might be numbered between 3100 and 3199. The next substation would have feeders and lines numbered between 3200 and 3299, etc.

Where a transmission-line loops through a small substation, the switches are given the number of the line and are identified by adding a letter after the number. For example, assuming that line No. 3135 loops through a small substation, one switch would be numbered 3135-R and the other numbered 3135-W. Only letters that are easily understood over the telephone are used for this purpose.

The work of the system operators, or load dispatchers, as they are called on this system, is similar to that of the load dispatchers* of the Consumers Power Company, in that they distribute loads among the different plants, order switching and separate the system in preparation for approaching storms.

System operation is carried on by four load dispatchers, who are located in the Public Service Build-

*See ELECTRICAL WORLD, Sept. 26 and Oct. 5, 1925.

ing and report directly to the system operator. The work is divided into three eight-hour shifts; the load dispatchers change shifts every two weeks. This allows one load dispatcher considerable time for inspection, the remainder of his time being devoted to assisting the other load dispatcher during peak-load periods.

The load dispatcher does not order boilers in or out of service, nor does he order machines in or out of service at any of the power plants or substations. However, he does furnish the power plants with the expected load. The plant engineer is responsible for operating the boilers and turbo-generators at the most efficient ratings.

A very extensive company-owned telephone system covers the major portion of the system, and the public telephones are used very little. Carrier-current telephones are used in connection with dispatching the load over one of the 132-kv. lines which extends northward into Michigan, near the Wisconsin-Michigan border line. The length of this transmission line is approximately 256 miles.

Conjectures and Speculations

ELECTRICAL CONDUCTION IN AIR

BY C. L. KASSON
Edison Electric Illuminating Company of Boston

ALL matter conducts electricity. It is only a question of degree. Insulation and conduction are relative terms.

Air conducts electricity. It conducts only slightly below the ionization point and more readily at the latter point. Why then is not ionization air breakdown? Is not air breakdown analogous to all breakdowns of matter under electric stress, with the difference that the products of the air breakdown are driven off from the energy source because they are heated and their places taken by fresh particles of air whenever there is a large volume of air?

Is not ionization of air in confined spaces a different action in that there are finally no fresh particles of air to rush in and all the air must be eventually changed in composition?

Why is not the above action dependent on the length of time the electric stress acts upon the confined air?

Why is not this the case in all highly stressed insulating materials, which must contain air voids?

Granting that air conducts below the ionization point. Why then is not the current flowing through the air related to the current at ionization in much the same way as the current in a solid insulation previous to rupture is related to that which flows at rupture under given stresses?

a. Air (normal)—one unit of current.

b. Air (ionized)—10^8 units.

c. Solid insulation (leakage)—one unit.

d. Solid insulation (rupture)—10^8 units.

Is not air slowly changed in the minute voids in insulating material at stresses below ionization, provided the stress is present for many thousands of hours?

In the case of corona around a wire:

Why is not corona simply air conduction in which the incandescent particles of broken-down air are being continually cast off and their places taken by fresh air particles? Is not the air envelope around a conductor increasing in its area as the square of the distance from the conductor?

If a given amount of power were conducted away from a conductor through the air, would not the watts per unit of air envelope diminish as the square of the distance? Would not the dissipated heat similarly vary and with it the incandsecence of the air particles?

From a given cylindrical wire, is not the impedance and resistance of the air, taken as a whole, decreasing as the square of the distance? Thus a given amount of power dissipated from a conductor in the air passes on to infinity, establishing a sharp pressure gradient near the conductor and practically a zero gradient after a short distance is covered.

Is this not similar to earth resistance? The great mass of earth exists at practically zero resistance. Why not so in air? Measurable earth resistances are those near by the grounded conductor. Is it not so in air? Suppose that air resistance is very high per cubic centimeter, how about the resistance of a 100-mile sphere of air from its center?

Radio broadcasting:

In the light of the foregoing, why does not radio power come through the air and not the so-called ether? Why is not the air envelope around the earth a conductor and at the same time a complete parallel network, so to speak, the effective resistance of which from a given point is relatively low except in the immediate proximity to the source of stress?

Light:

In view of the foregoing and since in corona the eye sees light, why is not light that which the eye perceives when the power content per infinitesimally small unit of air is sufficiently large?

A step further. Why not say that heat and light are not energy but the manifestations of power in matter or, over a given time period, the manifestations of energy in matter? If this is so, then perhaps daylight is the manifestation of solar energy in our atmosphere. In other words, solar energy as such would be unknown and unperceivable to us humans were it not for the fact that we are surrounded by gaseous matter.

A step further. If there be truth in these theories, then solar energy is of the nature of electricity, perhaps is electricity. This checks with the phenomena of lightning, which is the concentration of the locally distributed electrical energy in the atmosphere and the consequent air rupture at a given point.

Regulator Attention on Failure of Power

SOME of the older types of contact-making voltmeters that control the action of induction-type voltage regulators are so arranged that if the voltage of the line drops to zero gradually, the regulator will be run to its full-boost position. Then when power is restored at its normal voltage suddenly by closing a switch, the voltage on the distribution circuit is too high until such time as the regulator can adjust it. If power fails suddenly, the regulator may not have time to operate and run the regulator very far in the "boost" direction. However, the Consumers Power Company of Michigan instructs its operators to run such regulators back to "neutral" by hand if necessary under these conditions. The modern types of contact-making voltmeters run the

regulator in the "buck" direction when power fails, hence these do not require attention.

If the voltage varies much, and particularly if the variations are rapid, while the trouble is developing the regulator motor may "race" first in one direction then in the other. If this occurs, it may be desirable, points out this company, to open the switch and cut out the motor so as to prevent unnecessary and useless wear of the mechanism and heating of the motor.

Erecting Statue on Alabama Building

BY R. K. JEFFRIES
Warehouse Manager Alabama Power Company, Birmingham, Ala.

THE method by which the 4,000-lb. statue of "Electra" was raised to the top of the new office building of the Alabama Power Company was rather unusual, as the contour of the building necessitated the making of two lifts, one from the street to the thirteenth floor balcony and the other from the balcony to the pedestal.

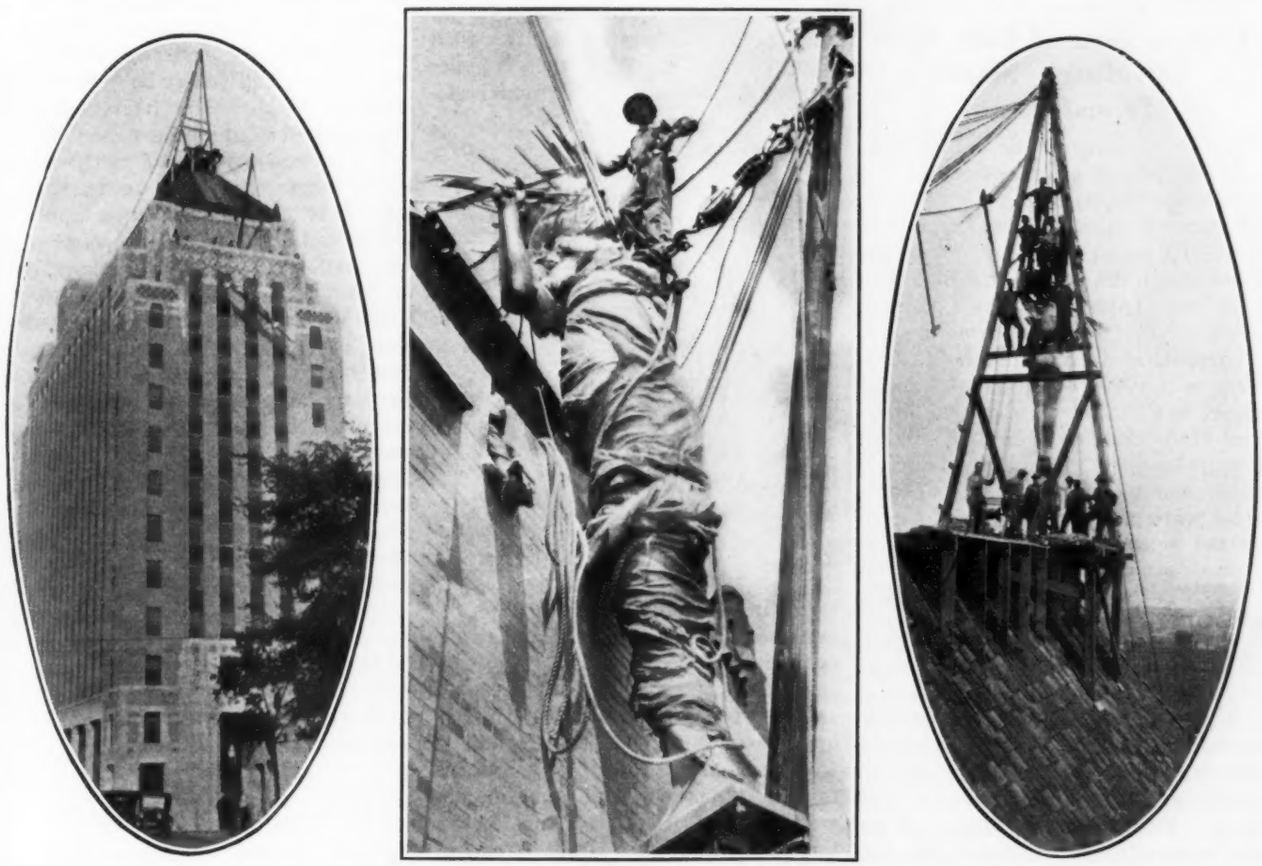
In order to raise the 35-ft. pole for a boom used in the first lift it was necessary to erect a small boom made of pipe, which could be easily handled on the balcony. The small boom was then dismantled and a large Chicago boom was made from the 35-ft. pole. To guy this boom to the building steel two of the pyro-bars, roof slabs and a number of tile were removed. A large winch was used in making the first lift. In order to anchor this winch in place, bolt holes were drilled through the balcony floor.

The cresting on the ridge of the building had to be removed and a scaffold erected to handle the rigging and equipment for the second lift. Owing to the light construction of the roof, it was necessary to cut openings in it to get bearings on the steel members under a portion of the larger scaffold and under the A-frame or derrick that was erected. Six 6x8-in. timbers were used for bents under this platform and A-frame, and the main portion of the platform was decked with 3x12-in. timbers.

Considerable difficulty was encountered in obtaining timbers suitable for the A-frame. The timbers used were 3x8-in.x40-ft. pine bolted together giving a section of 6x8 in.

After the A-frame was assembled on the roof a small hand winch was carried out onto the platform and put together. This winch was used in raising the A-frame and making the second lift of the statue.

The first lift was completed in two hours and ten minutes. The Chicago boom and statue then had to be swung in toward the eave of the roof and a new hitch secured in the back of the statue in order to make the second lift with the A-frame. The second lift was accomplished by taking up on the falls attached to the A-frame and slacking off on the Chicago boom fall so that the statue at no time would rest on the roof. After it had reached the highest point, which was 6 ft. above the



AT LEFT, BUILDING OF ALABAMA POWER COMPANY, SHOWING POSITION OF HOISTING FRAME ON ROOF. IN CENTER, THE STATUE AS IT HUNG FROM THE DERRICK THIRTEEN STORIES ABOVE THE GROUND. AT RIGHT, THE A-FRAME ERECTED ON ROOF, SHOWING POSITION OF STATUE AT COMPLETION OF UPWARD JOURNEY

pedestal, the A-frame was boomed up so that the anchor bolts could be entered in the holes in the pedestal. Then the statue was lowered in place and the nuts securing the rigging and burlap were removed.

The statue is anchored in place with two 2½-in. steel rods on 6¾-in. centers, which go up into the statue to about the knees, these bolts being leaded in. The bolts extend from the base of the statue 6 ft. and go through a plate at the top of the pedestal which is 1½ in. thick and a plate located 5½ ft. below the top of the pedestal. It is held rigidly in place by nuts secured at both top and bottom of the lower plate.

Comparison of Bids Made for Muscle Shoals Transformers

THE contract for furnishing and installing transformers and switching equipment for Muscle Shoals, which was awarded to the General Electric Company on July 20, drew forth the following bids and also one from the Allis-Chalmers company for the transformers alone The contract includes twelve 21,666-kva., water-cooled, single-phase, 60-cycle transformers; eight 400-amp. and eight 600-amp., 154,000-volt oil circuit breakers; lightning arresters, disconnecting switches, switchboard, steel work and complete installation of the equipment:

General Electric	Westinghouse	American Brown-Boveri
$799,000	$799,013	$1,106,857
230 days*	225 days*	580 days*

* Time required for completion of work after signing of contract.

The General Electric Company guaranteed a full-load transformer efficiency of 99.43; the Westinghouse company 99.25, and Brown Boveri 99.20. The bids were evaluated on the bases of, first, $100 per day for completion of work, and second, at $1,000 per transformer per one-tenth of 1 per cent full-load efficiency with 99 as a basis. Working out these evaluations, the three bids are reduced to a comparative basis of the following order:

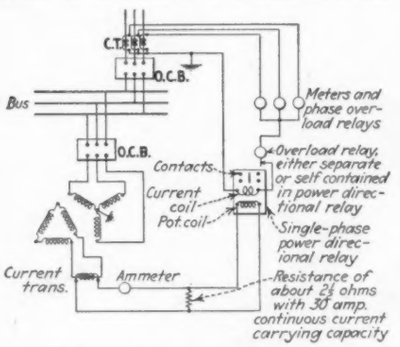
	General Electric	Westinghouse	American Brown-Boveri
Efficiency in per cent	99.43	99.25	99.20
Time in days	230	225	580
Contract bid	$799,000	$799,013	$1,106,857
Add for time	23,000	22,500	58,000
	$822,000	$821,513	$1,164,857
Deduct for efficiency with 99 as basis	51,600	30,000	24,000
	$770,400	$791,513	$1,140,857

Application of Directional Relay to Ground Faults

BY C. F. BENHAM

Assistant to General Superintendent
Great Western Power Company,
San Francisco, Cal.

IN THE problem of relaying circuits on faults there often arises the question of handling grounds. Much better action can be secured with a ground or residual relay in the common circuit of a set of star-connected current transformers than by the use of phase overload relays only, as the residual relay under normal load conditions will have no current in its current coil and hence can be given a very small current and time setting, thereby insuring quick action on ground faults. Still another problem arises when it is desired to introduce a directional element in the relay scheme and prevent a circuit opening under certain conditions.



CONNECTIONS FOR SINGLE-PHASE POWER DIRECTIONAL RELAY

A standard single-phase power directional relay with an external resistance, which is either short-circuited or removed, is used

Until quite recently there were no relays available that were directly applicable to such a scheme, and it was necessary to adapt other relays to the purpose. One method developed by J. H. Paget for use on the system of the Great Western Power Company has proved quite satisfactory. This makes use of a standard single-phase power directional relay of the type with an external resistor in the potential circuit connected as shown in the accompanying diagram. By short circuiting this resistor the relay can be made to operate with a very small potential. A relay with a high-resistance potential coil may also be used by rewinding the coil for a lower potential. Potential for the low-voltage coil of the relay is secured by introducing a resistance of about 2½ ohms with considerable current-carrying capacity in series with the secondary of a current transformer, thus producing a drop in potential across the resistance when current flows in the circuit. The current transformer is placed in series with the delta-connected winding of a transformer bank as shown. This transformer bank may be either a star-connected auto-transformer bank interconnecting two systems of different voltages, with a tertiary winding connected in delta, or it may be a relatively small-capacity transformer bank, with the primary side connected star and the secondary delta, used simply for establishing a grounded neutral on an otherwise delta system in order to give relay protection on ground faults.

More recently relays have been developed with two current elements, one of which can be connected directly in the delta current-transformer circuit and hence do away with the resistance used in the foregoing scheme. This, however, requires two relays where a double-throw contact is needed to select one or the other of two breakers, as in the case with parallel lines. In some special cases where it is desirable to transfer the ground directional relay from one grounding bank to another, two relays would be required for each bank, as it is not desirable to do switching on a current transformer directly. In the scheme used by the Great Western Power Company this switching can be done on the portion of the current-transformer circuit that is shunted across a resistance, and thus one relay will serve the purpose of four of the later type relays. Hence the first scheme still has certain advantages that have not been entirely supplanted.

Examination of Meters

THE expense of making acceptance tests on single-phase domestic meters is not considered warranted by the Northern States Power Company, because of the accuracy of instruments that are now turned out by manufacturers and because installation tests are made anyway. However, mechanical examination is made for broken dial glasses, bent hands, incorrect registers, dirt and iron filings, the latter being removed with compressed air.

When old meters are brought in, the principal causes of inaccuracy watched for are aging of the magnets, friction of registers and corrosion of same.

Commercial Activities and Public Relations

Dairy Sterilizers Prove Profitable

BY B. D. MOSES*

ASKED the question, "What in your estimation would be the biggest help in the way of electrical equipment in the small dairy?" dairy inspectors of the State of California† replied that there was a great need for a small electric dairy sterilizer. When the sentiment of the dairy inspectors was made known to the California Committee on the Relation of Electricity to Agriculture, it determined to investigate the practicability of electrically heating water for sterilization purposes.

The committee found that about a year ago Fred B. Fair of San Joaquin, Cal., developed an electric sterilizer, using a tank similar to that used for oil sterilizers, equipped with an electric heating element. A little later Wellman Brothers of Modesto, Cal., took up the work of developing an electric sterilizer. Since that time about one hundred electric sterilizers have been built and sold to California dairymen.

These sterilizers use a 4-kw. or 5-kw. heating element with a tank holding 17 lb. of water and a sterilizing container capable of taking four cans. Assuming an average connected load of 4 kw. per sterilizer and an average consumption of 3 kw.-hr. per day, the cost of operation at 3 cents per kilowatt-hour will be 9 cents per day, which compares favorably with 4 to 9 cents per day for gas- or oil-heated sterilizers, in view of the greater convenience of the latter.

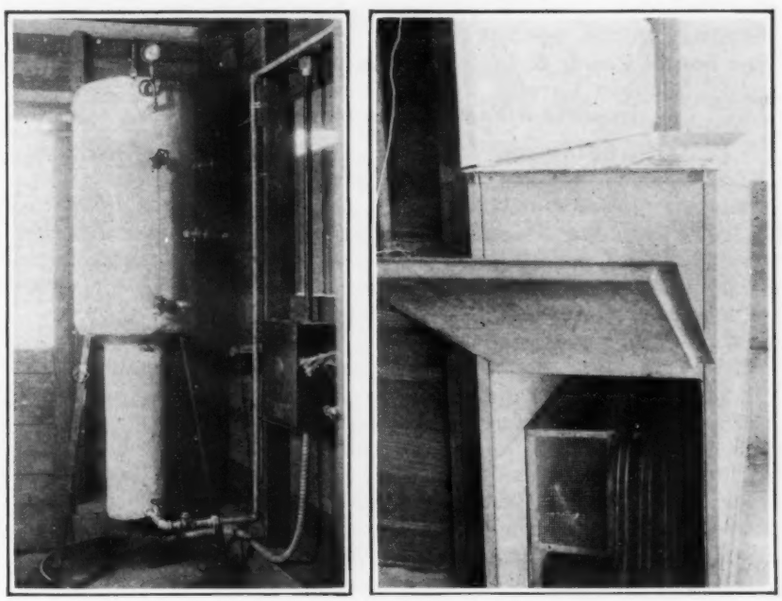
There are 30,000 dairies now operating in California that are using some type of small sterilizer. On the basis of 4 kw. connected load and 3 kw.-hr. per day working, the potential load is 120,000 kw. and the potential consumption 32,850,000 kw.-hr. per year, which, at an average of 2 cents per kw.-hr. would produce a yearly revenue of $657,000 to California power companies. To develop this market successfully the committee finds that the first cost of the four-can size should lie between $50 and $100.

Several sterilizers were tested to determine effect of heat insulation, effect of quantity of water on power consumption, effect of size of heating element on power required, effect of outside air temperature, relation between temperature within the sterilizer to that within the can and to that of the metal of the can and the practicability of installing an automatic power cut-off.

Tests with a 3-kw. and a 5-kw. heating unit on the same tank showed that although the 5-kw. unit was on for only 22 minutes, it consumed only 2.07 kw.-hr. and the time of sterilization was 47 minutes, whereas with the 3-kw. unit, power was on for nearly 47 minutes and the consumption was 2.29 kw.-hr., yet the time of sterilization was still 47 minutes. It is therefore obvious that by increasing the size of the heating element, the time of heating is materially diminished but the cooling rate, which is the important thing, is not affected.

The use of a thermostatic switch permanently to interrupt the circuit at some such temperature as 210 deg. will operate satisfactorily, providing cooling is not too rapid and that heating has not been rapid enough to decrease the time of sterilization below a safe minimum.

A careful study of the tests shows that heat conservation is of great importance, a reduction in radiation losses making possible the use of a thermostat and increasing of time of sterilization without added costs. The ideal sterilizer would seem to be one with the heating element just large enough, the correct quantity of water, and insulation to the extent that a thermostat cutting off the power between 200 deg. and 210 deg. F. will result in a minimum consumption of energy and leave a safe margin of exposure to the sterilizing temperature of 170 deg. F.



ELECTRIC DAIRY STERILIZER ON A SAN JOAQUIN VALLEY FARM WHERE 80 COWS ARE MILKED DAILY

Left—View of the insulated water tank containing a 5-kw. heating element. Right—Sterilizer box for the dairy utensils. Over a period of 5½ months 4,170 kw.-hr. was consumed at a cost of $69, an average cost for sterilizing of 43 cents a day.

*Division of agricultural engineering, University of California Farm, Davis, Cal. Also executive secretary California Committee on the Relation of Electricity to Agriculture.

†The State of California requires that all dairy utensils be thoroughly cleaned and then subjected to a sterilizing temperature of at least 170 deg. F. for at least fifteen minutes, where dairies are selling market milk.

Co-ordinating Customer Appeals in Electric Shop

SHOW windows of the Nebraska Power Company's new building in Omaha, fronting on two streets, supplement the customer appeals of an automatic demonstrator just within the entrance and of displays within the electric shop through

which the customer must pass to pay electric bills.

Although the displays are naturally changed to attract attention, recently the show windows were devoted to an inexpensive type of electric cooker of the fireless-cooker type, a percolator, domestic refrigeration and electric sewing machines. The cooker was being sold for $13.85 on the basis of 85 cents down and $1 a month. Old coffee pots were accepted as the equivalent of 75 cents in payment on the electric percolators, which sold at $7.50.

A number of appliances that should be in every home, such as an iron, percolator, toaster, vacuum cleaner, table lamp, grill and electric cooker, are displayed by the automatic demonstrator. Other electrical devices are tastefully displayed around the shop, even certain radio equipment being sold to attract customers.

Over 2,000 Ranges Sold in 60-Day Campaign

Puget Sound Power & Light Company Establishes Record—Cooking Schools, Careful Preparation and Advertising Are Important Factors Contributing to Success

AN UNEQUALED record for electric range sales during any 60-day campaign so far as is known was established by the Puget Sound Power & Light Company when this central station, operating in western Washington, sold 2,043 ranges during the period from April 1 to May 31, 1926.

One of the most important factors contributing to the success of the campaign was careful advance planning. Plans were made and approved at the annual district sales managers' meeting three months in advance of the opening date for the campaign. Preparatory work in the form of newspaper cooking schools was begun six weeks previously to the campaign start. These newspaper cooking schools were operated on the standard plan of the Edison Electric Appliance Company, cooperating with the newspaper, in order to create general public interest. Special range sales dinners were held in each district of the company, when the general plan of the campaign was announced and explained to all employees and a range sales talk was given by a factory representative of the manufacturer. Following the general public interest created by the newspaper cooking schools and newspaper advertising, selling demonstrations were held in the several offices of the power company, at which an attendance of approximately 1,200 interested women was secured.

The inducements offered customers for buying ranges were as follows:

1. Down payment of $10. Balance in time payments extending over 18 months.

2. Ranges sold for cash at company cost, plus 25 per cent.

3. Ranges sold on time at company cost, plus 34½ per cent.

4. A premium was offered to each purchaser of a range during the campaign; this was an immersion water heater or a $7.50 allowance on any other electrical appliance.

Regular commission salesmen of the company were paid 10 per cent commission on the cash price and other employees were paid a commission of 5 per cent on the cash price for making a sale or a 2½ per cent commission for recording the name of a prospect to whom a range was sold during the campaign. On such prospects 2½ per cent commission was paid to any other employee that completed the sale. Considerable interest was created by offers of special prizes between districts. Prizes were also offered to employees other than commission salesmen for selling the greatest number of ranges, the first prize being a complete electric kitchen equipment of a white enamel range, a water heater, a toaster and a waffle iron. It is interesting to note that six employees outside of the regular commission salesmen sold more than 51 ranges apiece during the campaign.

The results of the campaign are of particular interest when considered in connection with the number of residential customers on the company's lines. The total number of such consumers as of April 1, 1926, was 76,000 and the number of ranges served on the same date was 12,000, leaving 64,000 residential customers as prospects. The number of ranges sold from April 1 to June 1, during the campaign, was 2,043. Of the ranges sold during the campaign 60 per cent were sold with the water-heater premium, whereas in a similar campaign during 1925 only 30 per cent of those purchasing ranges accepted the water-heater premium. The revenue resulting from a water heater makes this appliance a particularly desirable type of premium in such a campaign.

The results of the campaign, which has added approximately $140,000 in annual revenue and brought the total number of ranges on the Puget Sound system up to more than 14,000, seem to justify the policy this company has pursued in the direct merchandising of ranges at popular prices.

Dry-Cleaning Eggs with a Sand Blast

BY L. W. PEDROSE
Seattle, Wash.

THE cleaning of eggs to make them presentable for marketing has been a necessary but tedious job for the poultry raiser. The simplest process was to wash the eggs with soap and water or cleansing compounds. These methods, however, softened the shells of the eggs and sealed the pores of the shell to a certain extent, hastening deterioration.

Now a machine has been perfected and put into use at three important production centers by the Washington Co-operative Egg & Poultry Association that dry-cleans eggs by sand blast economically, simplifies the grading and candling of the product and results in an increased market price of 1 cent to 4 cents a dozen.

The machine, which is electrically operated, has a capacity of 300 cases a day. The eggs are placed on an endless conveyor composed of rubber rollers and pass through a sand blast. The compartment where the cleaning is done is a tight sheet-metal housing in which a vacuum is maintained by means of an exhaust fan. A hopper at the top of the compartment contains fine white sand. The sand is carried downward through tubes to nozzles placed just above the conveyor. Air, under low pressure, forces the sand in a fine spray against the eggs as they roll past on the conveyor. As the eggs are cleaned, the dust is removed from the sand by the vacuum and is carried outside of the building. The sand falls to a pit and is picked up by bucket elevators and conveyed back to the hopper.

After leaving the cleaning com-

EGGS PASSING OVER THE CANDLER AS THEY COME FROM THE DRY CLEANER

partment, the eggs pass over a battery of powerful electric lights, where an attendant candles them as they pass along the conveyor. At the end of the conveyor table packers put the eggs in crates ready for the market. Due to the excellent condition in which the dry-cleaned eggs reach the market, they bring from 1 cent to 4 cents more per dozen than eggs cleaned by any other means. They also have a much higher rating for storage purposes, as the use of cleansing chemicals softens the shell and advances decomposition.

Simple Traffic Signal in Minneapolis

THE majority of heavy traffic intersections in Minneapolis are equipped with a traffic signal at the center of each intersection, the post having a ball-and-socket joint and concealed flexible cable connection at the street surface so it will be pushed over if anything strikes it. The post, which is of square cross-section, is made of pressed metal and contains a beacon light in the head, a rotating lighted semaphore just below which alternately reads "Stop" and "Go" and an alarm bell which rings (or a lamp that lights) before the traffic signal changes. The words are stenciled and backed by red and green light filters respectively so the signal is visible by night and day.

An adjustable timing element on the curb controls the semaphore and alarm bell or light. The duration of traffic in any direction can be adjusted.

The lighting load in each post (165 watts) is connected all the time the signal is displayed. The power for rotating the semaphore is periodic and adds a 35-watt peak on the light load, although diversity prevents pyramiding of these peaks unless all signals on the same street operate simultaneously.

The signal is made by the Griswold Traffic Signal Company of Minneapolis, and power for operating the signals is supplied by the Minneapolis General Electric Company on a metered basis at about $42 per signal-post-year. The energy consumption of one signal is approximately 1,350 kw.-hr. per year. The operating and maintenance expense is about $75 per post.

Energy Consumption in Average Farm Home

ENERGY consumption data for different farm household appliances, analyzed by the home economics division of the Iowa State College, have been made available by Miss Eloise Davison. Although methods of manipulation, personal habits and individual abilities of cooperators vary, Miss Davison considers that the accompanying tabulation gives a fair idea of the energy consumptions under normal farmhouse conditions.

AVERAGE ENERGY CONSUMPTION ON IOWA FARMS

Device	Kw.-Hr. per Month Per Family	Per Person
Electric range	102	25
Refrigerator	28-45	11-15
Ironing machine	2.8	0.46
Iron (used with it)	3	0.5
Electric cooker	5.5	0.9
Waffle iron	2	0.5
Washing machine	2	0.5
Percolator	6	1.5
Toaster	1.2	0.3
Glow heater	5	0.7
Water pumping (shallow)	795 gal. per kw.-hr.	
Water pumping (deep)	576 gal. per kw.-hr.	
Incubators	370 watt-hr. per chicken (79% hatch)	
Water heater (60-70 deg. inlet, 128 deg. outlet)	4.5 gal. per kw.-hr.	

AN INTERSECTION IN MINNEAPOLIS EQUIPPED WITH ELECTRIC TRAFFIC SIGNAL

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

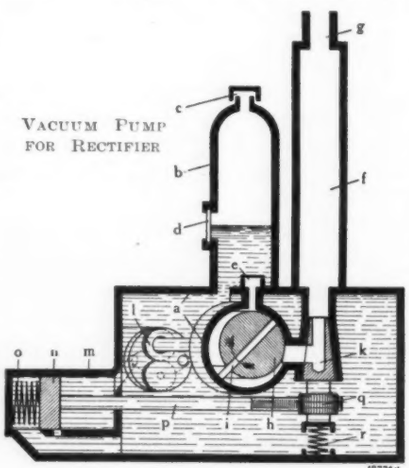
Hydro-Electric Development in Quebec.—CLARENCE V. CHRISTIE.—This is the second of a series of articles on power throughout the British Empire. The great water-power resources of the Province of Quebec, coupled with the bountiful supply of wood suitable for the manufacture of pulp and paper, have resulted in an extremely rapid development both in the hydro-electric power industry and the pulp and paper industry. The two are closely related. The government has adopted the policy of assisting in the utilization of the water-power resources by the construction of storage dams to regulate the flow of rivers so that the minimum flow may be increased and the capacity of the development may be increased in proportion. In the article a description of the physical characteristics of the Province of Quebec is followed by a brief review of the chief water-power resources, the latter accompanied by a map which shows not only the developed water-power sites but also the astonishing number of as yet undeveloped sites of considerable magnitude. Nearly half the wood pulp and nearly half the paper manufactured in Canada are produced in Quebec, the figures for the province being 1,170,314 and 805,594 tons respectively. The importance of the pulp and paper industry in the province as a consumer of electrical energy is shown by the following figures for the total installation of waterwheels in 1924, according to government records: Central stations, 961,307 hp.; pulp and paper companies, 223,144 hp.; others, 124,636 hp.; total, 1,309,086 hp. Including a large block of purchased power, the total employed in the pulp and paper mills in the province was 376,067 hp. The figures are for 1924. Finally, the possibilities of the electric steam generator, when cheap secondary power is available, are discussed. It is shown that if a supply of energy can be had at a price not greater than 0.12 cent per kilowatt-hour in a plant where coal costs $6 per ton or more, the production of steam by electric power is commercially feasible.—*World Power*, May, 1926.

Hydro-Electric Development of the River Aspe.—G. GOISNARD.—The river Aspe has its origin at the boundary line between France and Spain and drops 1,600 m. within 60 km. of its length. A company has acquired the water-power rights on this river and installed nine hydro stations along its flow. These plants have a combined capacity of 60,000 kw. and can furnish annually 300,000,000 kw.-hr. to the power system of southern France. The article under notice describes one of these nine stations, located at Esquit, operating under a head of 42 m., with installed equipment comprising three generators of 1,700 kva. each. The output of the station is transmitted over a 66-kv., three-phase line which connects it with the eight other plants. —*Revue Générale de l'Electricité*, July 3, 1926.

Transmission, Substations and Distribution

Effect of Internal Vacua Upon the Operation of High-Voltage Cables.—W. A. DEL MAR.—It has been known for some time that the internal mechanical pressure of cables is a factor in the quality of the insulation and that the oil used in impregnating paper for cable insulation has a high thermal expansion which may alter the internal pressure of cables with varying temperature. This paper considers the rate of pressure equalization in cables and the relative effects of slow equalization upon long and short cables, indicating that there may be considerable difference in dielectric properties depending on the length and past history in regard to temperature cycles.—*Journal of A.I.E.E.*, July, 1926.

Vacuum Pump for Mercury-Arc Power Rectifiers.—The development of mercury-arc rectifiers, with metal cylinders, has placed fresh stipulations upon the vacua required in order to satisfy



VACUUM PUMP FOR RECTIFIER

the increased demands made upon rectifier installations in service. The type of air pump indicated in the diagram has been so simplified that it may be used without modification in unattended stations as well as those which are not automatic.—*Brown-Boveri Review*, July, 1926.

Generation, Control, Switching and Protection

Improvement of Power Factor—EDGAR W. DOREY.—The first part of the paper summarizes the principal types of apparatus employed for the improvement of power factor and gives a description of the modern static condenser and also of types of power-factor-rectifying plants that have been developed during the past three years. The second part of the paper outlines various forms of power-factor tariff in force in Great Britain and is divided into two main classes—first, those based on kva. demand; second, those incorporating a power-factor bonus or penalty on the total supply bill. Systems of metering employed in conjunction with power-factor tariffs are briefly dealt with.—*Journal of Institution of Electrical Engineers (England)*, June, 1926.

Calculation of Fuses.—K. ZICKLER.—In spite of the wide and general use of fuses during the last 40 years, no practically applicable and fully reliable mathematical method is known today which would enable the exact dimensioning of a fuse wire for given conditions. The most thorough study of this problem was made 20 years ago by G. J. Meyer, who developed a formula for the calculation of fuse wires. Exacting tests made by the author to verify the validity of this equation showed that, under a number of conditions, certain correction factors have to be applied to make the calculated value check with the actual dimensions of the fuse wire. Experience from a great many tests, where material, length and size of the fuse wires were varied, have led finally to a revised new formula, the results of which are claimed to give perfectly reliable data. The new equation can be readily expressed graphically, in which form it lends itself easily to the evaluation of a fuse wire for any given conditions.—*Elektrotechnik und Maschinenbau.*—June 13, 1926.

Units, Measurements and Instruments

Impulse Test of Insulators—G. BENISCHKE.—Since electric impulse testing of machines, apparatus and insulators became more widely used, a great variety of test arrangements has become known. These arrangements consist of combinations of switches, condensers and spark gaps. Test results with them were far from uniform, however, and data obtained were not comparable. Literary controversies arose among those using different testing methods. It seems that these differences were due to complex connections with too many variable factors, which were hard to define and often impossible to reproduce by others. The writer of this article suggests a new, exceedingly simple impulse method, free from any undefinable factors. He provides a high-voltage testing transformer, a condenser and a spark gap, but introduces as novelty between the transformer and the condenser a synchronously revolving double-pole, double-throw switch. This makes the charging and the discharging of the condenser two absolutely distinct and totally independent functions; that is, while the condenser is being charged the gap and the tested apparatus are completely disconnected from it, and while it is being discharged the transformer is disconnected from the condenser. In the second part of the paper the writer attempts to give an explanation of what happens in an insulator when it is impulse-tested. From his own experiences, and from the results obtained by others, the author concludes that an impulse test is really not an electric test, but that it resembles more closely

a mechanical test, which releases latent stresses in the porcelain. The frequent shattering of insulators at impulse tests bears this opinion out. The 60-cycle high-potentional test, on the other hand, is a real electric test, readily disclosing electrically weak spots in the insulator. The author maintains that impulse testing of insulators should be called "electrostriction," which is an electro-mechanical phenomenon introduced first by Faraday and very little known as yet. As the striction is proportional to the square of the electric flux density, a hundredfold difference in line density on an insulator will result in a ten-thousandfold increase in mechanical stressing. Another discrepancy in impulse testing is the fact that the peak voltage actually occurring is higher than that measured with the customary sphere-gap method. Such a sphere-gap is calibrated with 60-cycle current, which makes it useless for voltages of impulse characteristics. Any attempt to calculate the relation between gap distance and voltage is futile, because too little is known yet about steep-front voltages. To attempt to do away with the discharge time delay on sphere gaps by ultra-violet light or radio emanation is uncertain in result on account of the difficulty of accurate dosing. Recently tests were made with the klydonograph to measure discharge voltages, resulting in great discrepancies between values measured with spark gaps and by this new method. Investigators seem to rely more on the values given by the klydonograph. — *Electrotechnik und Maschinenbau*, July 11, 1926.

Illumination

Modern Illuminating Devices for Air Ways.—H. C. RITCHIE.—Some of the early types of equipment used in Europe in connection with the lighting of aviation fields are illustrated and described, together with a brief description of the more modern examples of lighting equipment used at present in this country for this purpose.—*Transactions of Illuminating Engineering Society*, May, 1926.

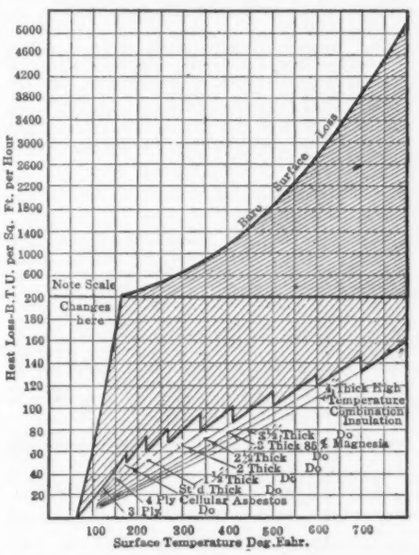
Relative Value of Daylight, Tungsten-Filament and Mercury-Arc Light and Mixtures.—F. E. CARLSON.—In this paper an attempt is made to determine the relative values of various types of industrial illuminants and daylight. In addition to this the question of the desirability of mixing artificial light with daylight is considered.—*Transactions of Illuminating Engineering Society*, July, 1926.

Electrophysics, Electrochemistry and Batteries

A Belt as a Direct-Current Generator.—B. OUGRIMOFF.—A 75-hp. electric motor was arranged to drive, by means of a leather belt approximately 9 ft. long, a unipolar generator revolving at a speed of up to 8,000 r.p.m. Owing to a very small pulley on the latter machine, considerable belt slippage occurred, and this electrified the driving belt. A Siemens-type electrostatic voltmeter permitted reading of the generated direct-current voltage at any point of the belt by means of a small brush resting on the belt. With a belt speed of 21 m. per second a maximum voltage of 80 kv. was measured. A milliammeter indicated 2 milliamperes, or an output of 160 watts direct current. The obtained voltage increased considerably with rising slip of the belt. The author succeeded in lighting a Brown cathode-ray tube, and he hopes to be able to supply an X-ray tube with this belt generator. Several curves are given to indicate how the voltage was distributed along the belt; in all cases the maximum was located near the middle portion. The current generated was of negative potentional.—*Revue Générale de l'Electricité*, June 19, 1926.

Heat Applications and Material Handling

Heat Insulation in Industrial Plants.—L. B. MCMILLAN.—This article provides a general survey of the more



HEAT LOSS UNDER VARIOUS CONDITIONS

common heat applications and losses due to lack of suitable insulation. Several charts are used, indicating various classes of heat waste. The discussion refers not only to losses of heat under still-air conditions, but also to those where the air is in rapid motion. A result of the use of insulation, which is receiving increased attention, is its effect in maintaining temperature head. In the case of superheated steam, for example, the loss of heat by radiation results in a decrease in temperature, and the saving effected by insulation represents a conservation of the most valuable portion of the heat in the steam, because the capacity of the steam to do useful work is dependent not only upon the amount of heat it contains but also upon the temperature. —*Engineers and Engineering*, July 15, 1926.

Does Carbon Dioxide Set Fire to Coal-Storage Piles?—H. G. TURNER and ERIC SINKINSON.—The subject of this paper is a discussion of the effect of carbon dioxide on coal stored in piles. Easily liquefiable gases like carbonic gas form a film on coal more easily than gases like oxygen. The formation of such films creates heat that starts the combustion process. The authors found that on passing carbon dioxide through a mass of pulverized coal the elevation of temperature was considerable. It would appear from the experiments briefly set forth in this paper that the absorption of carbon dioxide by coal is an important factor in the production of the initial temperature necessary for its spontaneous combustion.—*Coal Age*, July 29, 1926.

Traction

Coke-Oven Locomotive.—W. HILDEBRAND.—A large coke plant with 40 coking ovens requires an electric locomotive to handle a coke-quenching car along the row of furnaces. The ovens tnemselves, owing to local conditions, are situated along an inclined track with a grade of 14 per cent. To give the required tractive effort a cog-rail locomotive is necessary. Of the necessary 14 tons drawbar pull, adhesion provides 5.4 tons and the cog wheels 8.6 tons. A 500-volt, three-phase motor of 383 hp. with double spur-gear reduction actuates a jack shaft, from which a horizontal rod drives the two main shafts with adhesion and cog wheels. Four independent brakes are provided. The machine is in operation 24 hours per day and serves 51 ovens daily with an energy consumption of 180 kw.-hr. for that period.—*Electrotechnische Zeitschrift*, July 8, 1926.

Electrification of the State Railroad from Stockholm to Gothenburg, Sweden.—The electrification of this main railroad was recently completed after three years of construction work. The distance is 458 km. and the current used is 16,000-volt single-phase at 16⅔ cycles. As sufficient power sources were not available, the government erected a new water-power plant on the Göta River, about 20 miles from Gothenburg. The most interesting features about this plant are the gigantic turbines, one of Kaplan-type and two of Lawaczeck type, with a wheel diameter of 19 ft. and 19 ft. 8 in. respectively.—*Teknisk Tidskrift* (*Sweden*), June 12, 1926.

Telegraphy, Telephony, Radio and Signals

Attenuation of Wireless Waves Due to Resistance of the Earth.—R. L. SMITH-ROSE and R. H. BARFIELD.—The paper calls attention to the present condition of knowledge on the subject of the attenuation of wireless waves traveling over the earth's surface, due to energy absorption by the earth itself. The theories put forth on this problem by Sommerfeld and Zenneck are briefly outlined, and it is shown that the latter has taken account only of a special case of the more general theory of Sommerfeld. The results deduced from this theory have been worked out for some typical practical cases of both short-wave and long-wave transmission, but, owing to the complete lack of experimental evidence, no practical test of the theory has yet been made.—*Journal of Institution of Electrical Engineers* (*England*), July, 1926.

Scientific & Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Condensers for Power-Factor Improvement

A new type of condenser has been developed for direct use at 13,200 volts and voltages somewhat above this value. It is desirable to use auto-transformers for voltages below 13,200 volts. This condenser is a modified application of a special high-voltage paper-insulated cable with the sheath and various conductors connected to secure more homogeneous utilization of the dielectric. The cable is coiled and placed in a grounded metal tank. The same condensers may be used as protection against surges.—*Neirowsky & Company, Porz-am-Rhein, Germany.*

Cut-Outs, Oil-Fuse Type

The method of formation and escape of the arc gas has been observed under actual short-circuit conditions, resulting in valuable information as to the effect of the forces within the cut-outs while interrupting large currents. An interesting feature of this investigation was the confirmation of the fact that the design of the cut-out is such as to keep the contacts under oil at all times, thus preventing the arc from damaging them when the fuse blows.—*General Electric Company, Schenectady, N. Y.*

Cutting of Metals Under Water, Electro-Gas

The method is simply the generating of heat by means of an electric arc using a carbon electrode and introducing oxygen into the heated area in order to make a chemical combination with the steel in the same manner as with the oxy-acetylene flame which is used in ordinary above-water cutting operations. The oxygen for under-water cutting is furnished from bottles such as are used in oxy-acetylene cutting operations.—For details see *American Welding Society Journal*, March, 1926, page 55.

Electron Spectrograph, a New Type of

The slit system of the instrument is essentially a Hull magnetron with a very narrow slit in the anode. This slit is parallel to the oxide-coated filament which is mounted on the axis of the cylindrical anode and the whole is placed in a uniform magnetic field parallel to the filament. Before the electrons reach the anode they are acted on by both the radial electric field and the magnetic field as in the magnetron, but those which pass through the slit travel in circular paths under the action of the magnetic field alone.—*Kenneth Cole, Rockefeller Hall, Cornell University, Ithaca, N. Y.*

Cut-Outs, Expulsion Type

The gas barrier between the contacts inside the wooden or porcelain housing, which was first demonstrated on the manufacturer's cut-outs in competitive tests, has been perfected. The effect of various fuse metals on the operating characteristics at both high and low currents has been determined. Considerable information has been secured on the strength of the arc and its effect on a number of materials used in the cut-outs. Valuable data that have been secured on the effect of thickness, shape, size of holes, etc., make possible a more scientific design.—*General Electric Company, Schenectady, N. Y.*

Fire Announcers, and Extinguishers

Extensive experiments have been performed in Paris on devices of different makes, under competitive conditions. Some extinguishers were tried on high-tension electric arcs. See *Recherches et Inventions*, April 1, 1926, page 200.

Fuses, Tests on

A series of tests conducted on renewable and one-time inclosed cartridge fuses indicated that the rupturing capacity of the fuse is largely a function of the length of the fuse element and the volume of the cartridge fuse case. The time for interrupting a circuit was found to be very selective between fuses of different sizes. The melting time of the fuse was a direct function of the thermal capacity of the element and inversely to the heating effect of the short-circuit current. It was found that the published ratings of manufacturers for the smaller-size fuses were not met in this series of tests.— *Electrical Apparatus Committee, N.E.L.A.*

Glazed Ware, Measuring Thermal Dilation of

The bureau has recently perfected an optical method for measuring with extreme accuracy the thermal expansion of the glazes used in the ceramic industry. An accurate knowledge of this property will aid in reducing the losses from cracking of the glaze.—*Bureau of Standards, Washington, D. C.*

Thermocouples, Porcelain Protection Tube for

The "freezing" of the glaze of the tube to the wall of the furnace, or to the ware with which it comes in contact, is a constant source of annoyance and loss of tubes by breakage. The bureau has overcome this difficulty by the production of a "double tube" which is highly refractory, satisfactorily rigid at operating temperatures, and which is rendered impervious to gases by a coating of glaze between the double wall of the tube.—*Bureau of Standards, Washington, D. C.*

In Progress or Purposed

Boiler Plate, Embrittlement of

A method of procedure was devised whereby the embrittlement effect could be produced at will, thus making it possible to study both the conditions under which it occurs and remedies for its prevention. The results indicate that two conditions must be present simultaneously to produce the embrittlement effect—first, the stressing of the metal above the yield point, and, second, the concentration of sodium hydroxide to a point which is in excess of 350 grams per liter. Parallel tests omitting the sodium hydroxide show no effect. For details see authors' recent A. S. T. M. paper.—*S. W. Parr and F. G. Straub, University of Illinois, Urbana.*

Glue, Tests for

The absence of a reliable method of testing adhesives for timber has long been a serious obstacle, and promising results have been obtained in preliminary trials of a new form of test piece in which the energy absorbed on fracture of the joint is measured. It has also been demonstrated that, provided a small amount of a heavy loading material, such as lead sulphate, is incorporated in the glue, which does not materially affect the strength of the joint, X-rays may form a valuable means of detecting flaws in joints in finished structures. —*Department of Scientific and Industrial Research, London, Eng.*

Hysteresis, Rotational, Utilization of

There is a possibility of getting a powerful rotation, in multiphase alternate-current fields, of magnetic materials which are either non-conducting in themselves or are made so by being reduced to fine powder and then made up into solid disks or cylinders with some binding material, such as glue or shellac, which insulates the particles from one another. Such disks or cylinders, which form miniature induction rotors without windings and with non-conducting cores, can be made up of powdered magnetic materials such as hard cast-iron dust, hard steel grit, nickel, cobalt, magnetite or pyrrhotite; in such bodies no appreciable eddy currents are produced, the rotation being due entirely to hysteresis.—*W. M. Mordey, London, Eng.*

Meter, Totalizing, for Separated Loads

One of the latest developments of the Ontario Hydro-Electric Power Commission is a system of totalizing a number of power loads fed into a network at a number of separated points and recording the summation upon one graphic instrument. Continuous experimentation has been carried out upon this system, in co-operation with a manufacturer, and the apparatus, as development proceeded, has been submitted to tests in the laboratory. The results have been most encouraging, and a trial installation is now in service.—*Hydro-Electric Power Commission, Toronto, Ont.*

Varnishes, Insulating, a Base for

Some preliminary trials with aluminum as a base seem to indicate an advantage for that metal; consequently, a series of co-operative tests by ten laboratories on several different samples of varnish were made, with aluminum, copper and kraft paper, respectively, as the base. The final results of these tests are not yet available. —*Committee D-9 of the A.S.T.M., Philadelphia, Pa.*

Suggestions for Research

Corrosion, Prevention of

Efforts have been made to develop electroplating of simultaneous deposits of copper and nickel similar to monel metal. The importance of corrosion research to industry in general is very great and will doubtless assume even greater importance. —*G. W. Vinal, Bureau of Standards, Washington, D. C.*

Inductance in Synchronous Machines, Variations in

In a paper on variable leakage inductance in synchronous machines presented at the Niagara Falls regional convention of the A.I.E.E. in May, 1926, V. Karapetoff proposes to characterize this inductance by its average value and the maximum departure from the average. No method is suggested of determining these quantities experimentally on a given machine, and it is desired to develop such tests.

Insulator Strings, Horns on

It is becoming customary to provide a horn at the junction of the line conductor with a string of suspension insulators. The function of the horn is to grade the electrostatic stresses and to keep the arc of a flashover away from the disks. It appears that comparatively unimportant changes in the shape or length of such horns affect their performance to a considerable extent. It is desired to investigate the influence of the shape both theoretically and experimentally.

Surge-Tank Problem, by Experiments on Models

There seems to be no hope of a formal mathematical solution of the problem of flow of water and distribution of pressures under transient conditions in a pipe line with a surge tank. Two indirect methods suggest themselves, viz: (a) By using a small pipe and a model tank; this method has been tried by A. H. Gibson (*see Institution of Civil Engineers* (British) *Proceedings*, 1924-25. Vol. 219, page 161). (b) By interpreting the equations of flow electrically and studying an equivalent network of resistances, inductances and capacitances oscillographically. The necessary theory will be found in C. A. Nickle's paper "Oscillographic Solution of Electro-mechanical Problems" *A.I.E.E. Journal*, 1925, Vol. XLIV, Page 1277.

Welding, Problems in

The May, 1926, issue of the *Journal of the American Welding Society* is largely devoted to papers and discussion on fundamental research problems in welding. Anyone interested in the subject will find there numerous suggestions for an investigation which would help the industry.

News of the Industry

Varied Program for I.E.S.

Twenty Papers to Be Given, Including Seven Which Review Two Decades of Progress

WHEN the Illuminating Engineering Society assembles for its twentieth anniversary convention at the Essex and Sussex Hotel, Spring Lake, N. J., on Sept. 7, delegates will find an excellent technical and entertainment program awaiting them. The address of welcome by Thomas N. McCarter on the afternoon of that day will be responded to by President M. Luckiesh, and Secretary L. H. Graves' report will be followed by the report of the headquarters extension bureau, presented by G. H. Stickney, that of the committee on progress, by F. E. Cady, and a paper by A. J. Sweet on "A Basis of Rating for Measuring the Quality of Street-Lighting Service."

On Wednesday morning Sept. 8, these papers will be given: "Lighting and Contrast," P. W. Cobb and F. K. Moss; "Lighting a Ballroom for Championship Tennis," Ward Harrison and P. R. Holmes; "Light in Medicine and Surgery," Dr. Herman Goodman, and "Underwater Illumination," W. A. McKay and S. G. Hibben. In the afternoon there will be a golf tournament, and for the evening it is planned to have a lecture of a popular nature on some scientific subject related to lighting by an authority of national reputation.

Thursday morning a natural-lighting session will include these papers: "Making Your Windows Deliver Daylight," W. C. Randall and A. J. Martin; "Transmission of Light Through Window Glass," E. H. Hobbie and W. F. Little; "Natural Lighting in Schools," A. F. Beal, and "Relative Effectiveness of Various Methods of Control of Light Through Windows," H. H. Higbie. In the afternoon, at a lighting service committee session, four sections of the "Lighting Sales Manual," prepared by a joint committee of the I.E.S. and the N.E.L.A., will be presented as follows: "Organization" W. T. Blackwell; "Activities," J. F. Mayo; "Equipment," J. P. Campbell, and "Engineering," R. B. Brown, Jr.

TWENTY-YEAR REVIEW

On Friday morning a symposium on "Twenty Years of Lighting Progress" will be divided as follows: "The Science of Light and Vision," E. C. Crittenden; "Concepts, Units and Standards," C. H. Sharp; "Commercial Lighting," Norman Macbeth; "Industrial Lighting," J. R. Cravath; "Street Lighting," P. S. Millar; "Lighting in Transportation," G. H. Stickney, and "Lighting Education," S. E. Doane. Four papers will be presented in the afternoon: "Lighting of the Sesqui-Centennial International Exposition," D. W. Atwater; "Art and Utility in Church Lighting," J. L. Stair; "An Investigation of the Reliability of the 'li' Test," M. Luckiesh, P. W. Cobb and F. K. Moss, and "Intensity of Light and Speed of Vision Studied with Special Reference to Industrial Situations," C. E. Ferree and G. Rand.

Small Damage from Storms in New York and New Jersey

Violent lightning and wind storms on Thursday and Saturday of last week in the southeastern end of New York State interfered in a minor degree with electric utility service in some districts, the main damage being caused by uprooted trees falling across communication and transmission lines. Apart from transit troubles due to flooding, New York City escaped unscathed so far as utility service was concerned. Telephone and electric service wires went down all over the central part of Westchester County on Saturday, the city of New Rochelle bearing the brunt of the storm. Mamaroneck, Larchmont and Harrison also suffered, and there was some suspension of light and power service, but this was promptly restored in all localities. Across the Sound, on Long Island, the municipality of Oyster Bay was hard hit, the damage extending to Locust Valley and other neighboring towns. Gangs of men were sent out at once to make repairs.

On Monday of this week a waterspout, causing much wreckage, brought about similar electrical trouble at Glen Cove and Sea Cliff, Long Island. In these places repair crews began work an hour after the storm had passed. The Westchester County communities are served by the Westchester Lighting Company and the Long Island towns are supplied by the Long Island Lighting Company.

Violent storms had to be contended with also in northeastern New Jersey by the electric utility companies operating in that territory; but here also the aggregate damage was not great and was quickly repaired.

Coming Meetings of Institute Are Scheduled

In addition to the Pacific Coast convention of the American Institute of Electrical Engineers, to be held at Salt Lake City on Sept. 6-9 (the program of which was printed last week, page 338), the following schedule of meetings has been approved by the board of directors:

New York regional meeting, Nov. 11-12, 1926.

Midwinter convention, New York, beginning Feb. 7, 1927.

Northeastern district regional meeting, April to May, 1927; place to be determined, with Pittsfield, Mass., and other places under consideration.

Annual convention, Detroit Section territory, beginning June 20, 1927.

A.I.E.E. Appointments

Chairmen of the General and Technical Committees for Current Year—Edison Medal Committee

AT THE first meeting of the board of directors of the American Institute of Electrical Engineers for the administrative year beginning Aug. 1, held in New York last week, President Chesney announced his committee appointments. The chairmen are as follows:

GENERAL COMMITTEES

Board of Examiners.—Erich Hausmann, Brooklyn, N. Y.
Finance.—H. A. Kidder, New York.
Sections.—Harold B. Smith, Worcester, Mass.
Meetings and Papers.—E. B. Meyer, Newark, N. J.
Publication.—L. F. Morehouse, New York.
Co-ordination of Institute Activities.—Farley Osgood, New York.
Student Branches.—C. E. Magnusson, Seattle.
Membership.—L. S. O'Roark, New York.
Headquarters.—G. L. Knight, Brooklyn, N. Y.
Law.—W. I. Slichter, New York.
Public Policy—Gano Dunn, New York.
Code of Principles of Professional Conduct.—John W. Lieb, New York.
Safety Codes.—J. P. Jackson, New York.
Standards.—J. F. Meyer, Washington.
Edison Medal.—Gano Dunn, New York.
Award of Institute Prizes.—E. B. Meyer, Newark, N. J.
Columbia University Scholarships.—W. I. Slichter, New York.
Licensing of Engineers.—Francis Blossom, New York.

TECHNICAL COMMITTEES

Communication.—H. P. Charlesworth, New York.
Education.—Paul M. Lincoln, Ithaca, N. Y.
Electrical Machinery.—H. M. Hobart, Schenectady, N. Y.
Electrochemistry and Electrometallurgy.—G. W. Vinal, Washington, D. C.
Electrophysics.—V. Karapetoff, Ithaca, N. Y.
Instruments and Measurements.—A. E. Knowlton, New Haven, Conn.
Applications to Iron and Steel Production.—A. G. Pierce, Cleveland.
Production and Application of Light.—P. S. Millar, New York.
Applications to Marine Work.—G. A. Pierce, Philadelphia.
Applications to Mining Work.—W. H. Lesser, Frackville, Pa.
General Power Applications.—A. M. MacCutcheon, Cleveland.
Power Generation.—H. W. Eales, St. Louis.
Power Transmission and Distribution.—Philip Torchio, New York.
Protective Devices—F. L. Hunt, Greenfield, Mass.
Research.—John B. Whitehead, Baltimore.
Transportation.—Cary T. Hutchinson, New York.

The board confirmed the appointment by President Chesney of new members of the Edison medal committee, for terms of five years each, as follows: John W. Howell, Harrison, N. J.; L. F. Morehouse, New York; David B. Rushmore, New York. The board also elected three of its membership as members of the Edison medal committee, for terms of two years each, namely, B. G. Jamieson, Chicago; H. A. Kidder, New York, and G. L. Knight, Brooklyn, N. Y.

Keeping Up with the Growth of Florida

General Engineering & Management Corporation Engineers Racing Against Time to Build Much-Needed Steam Plant on Withlacoochee River

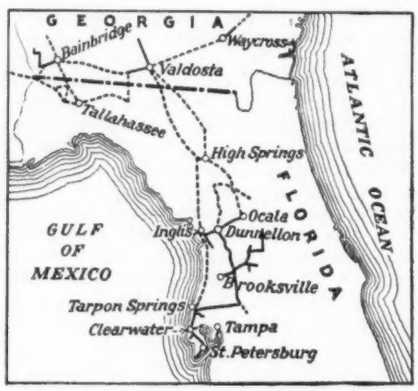
ENGINEERS and workmen employed by the General Engineering & Management Corporation have been racing against time to construct a steam plant at Inglis, Fla., on the Withlacoochee River. The time limit set for the completion of this plant is Jan. 1, 1927, according to the *General Engineering News*, a company publication, and although when the construction force reached the site on March 15 they found it in a wilderness 120 miles from Tampa, their base of supplies, the station is now well under way and will, it is confidently asserted, be ready when the new year arrives.

It took nearly a month to remove the ruins of an old phosphate plant and get the excavation work well on toward completion. Since then things have proceeded rapidly. Inglis is 10 miles from the Gulf of Mexico. Ample circulating water will be provided by the Withlacoochee. The plant will burn oil, with provision for changing over to coal should the latter fuel prove more economical at any time in the future. The boiler plant will have six 936-hp. boilers generating steam at 325 lb. and 200 deg. superheat. The generating plant will consist of two 12,500-kw. units. These with the company's new 18,500-kw. steam plant completed last year at St. Petersburg and the 5,000-kw. hydro-electric station nearing completion at Dunnellon, together with two hydro plants to be pushed to early completion, one near Tallahassee and one at High Springs, with a combined rating of about 13,000 kw., will provide enough energy to meet all demands on the company's system next year.

The General Engineering & Management Corporation, controlled by A. E. Fitkin & Company, has an extensive Florida territory extending from St. Petersburg in the south about 300 miles north to Waycross, Ga. This territory, more than 150 miles wide, has 310,000 permanent inhabitants and a winter population three times as great. Besides the older Fitkin companies—the Pinellas County Power Company of St. Petersburg and the Florida Power Company of Ocala—the organization took over the Central Florida Power & Light Company of Brooksville, the Lake County Power & Light Company, the Ocklawaha Power Company, the Ware County Power & Light Company, the West Florida Power Company of Tallahassee and the Georgia-Florida Power Company, and a large increase in generating capacity to care for the rapidly growing communities was called for. This imperative need led to the selection of the site at Inglis, where every facility for increasing the capacity of the plant as rapidly as it becomes necessary exists.

The Fitkin stations are to be extensively interconnected. The backbone of the transmission system will be a 110,000-volt line connecting the St. Petersburg plant at Tarpon Springs with the new plant at Inglis and extending to Valdosta, Ga. This line will be approximately 210 miles in length and will be of modern steel-tower construction. There will be approximately 480 miles of new 60,000-volt lines which will act as a secondary transmission system supplying the various towns and industrial loads throughout the territory. Parts of the 60,000-volt line will be installed as a loop system to insure absolute reliability of service under the most extreme conditions. Twelve substations will be provided for stepping down the high-transmission voltage to that used in the local distribution system.

By the construction of a 60,000-bbl. oil transfer station on the Gulf coast



FITKIN FLORIDA-GEORGIA TRANSMISSION SYSTEM, BUILT AND PROJECTED

and the employment of three company-owned barges to transport the oil to the St. Petersburg and Inglis plants, the latter 125 miles from this storage depot, a saving in fuel costs of $50,000 a year is anticipated.

No Present License for Flaming Gorge Likely

The Utah Power & Light Company has applied to the Federal Power Commission for a license in accordance with its preliminary permit of Aug. 15, 1923, covering the company's proposed development at Flaming Gorge on the Green River. Plans call for the construction of a concrete gravity dam 875 ft. long and 270 ft. high, creating a reservoir 60 miles long with an area of 37,200 acres. Equipment sufficient to develop 63,000 hp. will be installed. Under a resolution adopted by the commission last year no action is to be taken on any application on the Colorado River or its tributaries pending an agreement among the states of the basin as to allocation of water. Despite the importance of the Flaming Gorge project, which would regulate completely the Green River above the dam, it seems improbable that the commission will make any exception in this case.

Cancellation of the outstanding permits covering projects on the Salmon and Soule Rivers in Alaska, held by the Tongass Power & Light Company, will be recommended by the staff of the commission. Studies which have been made of the projects have led to the conclusion that neither is feasible.

Hydraulic Units for Conowingo of Great Dimensions

The William Cramp & Sons Ship & Engine Building Company of Philadelphia has issued a description of the three immense hydro-electric units which it is to furnish for the great hydro-electric power development at Conowingo, Md., on the Susquehanna River. The contract closed by the I. P. Morris department of the Cramp company covers the design and construction of three vertical-shaft hydraulic turbines, each rated at 54,000 hp. These units will, it is announced, be the largest hydraulic turbines in point of physical dimensions ever constructed. In power capacity they are exceeded by only a few installations such as the 70,000-hp. turbines of the Niagara Falls Power Company, the most powerful now in existence, and the 58,000-hp. and 55,000-hp. turbines at the Queenston plant in Niagara. Both of the last-named installations were also equipped with I. P. Morris turbines.

The Conowingo turbines, although thus of somewhat lower power capacity than the Niagara units, will on account of the lower head require considerably larger dimensions. The head at Conowingo will be 89 ft. and the turbines will operate at a speed of 81.8 r.p.m. The casings through which the water enters the turbines will be of plate steel of volute or spiral shape, and the draft tubes through which the water will be discharged from the turbine and carried to the tailrace will be of the Moody spreading type, molded in concrete and lined at the top with plate steel. Each draft tube will have a central cone which will extend up to the runner. The water entering the turbine casing will pass through large valves of the butterfly or pivot type, the internal diameter of these valves and of the entrance to the turbine casing being 27 ft. The runners or rotating elements of the turbines will be of cast steel built in sections and will have an outside diameter of 17 ft. 9 in. The horizontal over-all distance across the plate-steel casing will be 62 ft., and successive units will be spaced apart a distance of 72 ft. from the center of one unit to the center of the next.

These units when in operation will deliver electrical energy to the system of the Philadelphia Electric Company, operating in parallel with the large steam plants now supplying that system.

Building Transformers for Conowingo Development

Thirteen water-cooled transformers are being built by the General Electric Company at its Pittsfield (Mass.) plant for the hydro-electric development under way on the Susquehanna River at Conowingo, Md. These will insure a minimum loss of power in transmitting the 350,000 hp. of electrical energy to

be generated there over 70 miles of transmission lines to Philadelphia. The transformers, each with a rated capacity of 26,667 kva., will be used in stepping up the voltage from 13,800, at which current will be generated, to 220,000, at which it will be transmitted. The transformers have an efficiency of better than 99 per cent. Each weighs approximately 80 tons, occupies floor space of 14 ft. by 12 ft. and is 25 ft. 5 in. in height over the bushing.

The transformers will be arranged in four banks of three units each, with the thirteenth unit as a spare. Each bank, with a capacity of 80,000 kva., is designed to care for the output of two of the hydro-electric generators, totaling 72,000 kw. per bank. The current from two banks of transformers, at 220,000 volts, will be joined for transmission to Philadelphia. Each of the two transmission lines will have sufficient capacity to carry the full load of 252,000 kw. in case of trouble with the other one. When the final four generators are added to the seven that will form the initial installation a third transmission line of similar rating will be constructed.

How Use of Electricity in Canada Grows

Five Months of 1926 Show Gain of 17 per Cent Over 1925—Seasonal Recession Greatest in West—Nearly $65,000,000 a Year Investment Will Be Needed

THE Royal Bank of Canada has just issued a bulletin which states that the amount of electricity generated in Canada for Canadian use during the first five months of 1926 surpassed that produced in the corresponding months in 1925 by 17 per cent and that of 1923 by 38 per cent. The bulletin further states:

"There has been some comment to the effect that the rapid increase in power generation in Canada is due to the fact that many new communities are making use of current for lighting; but it should not be forgotten that the spread of home use of electric power is fairly constant, while the purpose of the present rapid installation of turbines is industrial. Certainly it may be assumed that industrial use accounts for the major portion of the recent expansion."

The kilowatt-hours generated daily throughout Canada for Canadian use during recent years is given as follows (000 omitted):

Month	1923	1924	1925	1926
January	19,079	21,120	23,198	26,676
February	19,492	21,384	23,160	27,880
March	19,305	20,747	22,452	26,711
April	18,860	21,079	22,482	25,979
May	19,557	20,824	22,297	25,952
June	19,049	19,779	21,470	.....
July	18,452	19,475	21,470	.....
August	19,356	19,868	21,485	.....
September	19,956	20,958	23,992	.....
October	20,785	21,209	24,400	.....
November	21,273	22,606	25,625	.....
December	20,461	23,479	26,573	.....

The daily production for Ontario and Quebec, is given as follows (000 omitted):

Month	1923	1924	1925	1926
January	15,568	17,538	19,179	20,994
February	16,033	17,768	19,257	22,155
March	15,844	17,349	18,677	20,897
April	15,640	17,550	18,595	20,779
May	16,321	17,346	18,504	20,950
June	15,901	16,318	17,831	.....
July	15,316	16,028	17,680	.....
August	16,022	16 423	17,192	.....
September	16,429	17,350	18,469	.....
October	17,138	17,934	19,376	.....
November	17,549	18,599	20,364	.....
December	16,795	19,275	20,883	.....

With respect to the above figures the bulletin says: "It is noteworthy that the daily production in Ontario and Quebec dropped off only 1,000,000 kw.-hr., while the drop for all Canada was 2,000,000 kw.-hr. This means that the seasonal recession has been more severe than usual in western Canada, amounting to about 15 per cent of the maximum, while the drop in Ontario and Quebec was only 4½ per cent. With the present limited information available there is no obvious explanation for this phenomenon. However, a 15 per cent summer recession is not heavier than the normal recession in the quantity of power used in the United States at this time of year. The very slight recession in Ontario and Quebec would indicate a continuous requirement for maximum load, and such indications are of importance in the analysis of future power requirements in this territory."

Cost of Future Installation

"A study of the probable cost of future turbine installation in eastern Canada indicates that between 1926 and 1945 about $1,300,000,000 will be required in capital expenditure, or that the average expenditure per year for the next twenty years will be close to $65,000,000," the current letter says in a further discussion of the Canadian hydro-electric industry. "In making this estimate the Dominion Water Power Branch concludes that of this total about $600,000,000 will be required in Ontario and nearly $700,000,000 in Quebec. Particulars of the capital invested in the central electric power station industry have been systematically collected and official census taken since 1917. The average capital expended in past developments is shown in the following table:

	Per Turbine Hp.	Per Total Hp.
General installation	$116.27	$109.46
Transmission	21.60	20.34
Distribution	20.62	19.40
General	17.84	16.79
Total	$176.33	$165.99

"The reason that the cost per total horsepower is somewhat less than per turbine horsepower is that the figure for the total includes the steam reserve and auxiliary, and this is usually considerably less in cost per horsepower than water-power development. It is thought that the average cost for development is pretty well stabilized and will not vary greatly for many years, but with the figures for transmission and distribution, the total will increase considerably."

Purchases and Mergers

Transactions Reported in Pennsylvania, Indiana and Nebraska—More Public Plants Give Up

THE White Haven Light, Heat & Power Company and the Dennison Electric Company, operating at White Haven, East White Haven and Tannery, Pa., have been taken over by the Pennsylvania Power & Light Company, with general headquarters at Allentown, Pa. These additional properties will come under the jurisdiction of the Hazleton division of the Pennsylvania Power & Light Company.

Plans for the merger of electric light and water utilities in southern Indiana cities and towns into a company to be known as the Mid-States Utilities Company are under way. The companies which will be merged are the Georgetown Electric Light & Power Company, Marengo Milling Company, Leavenworth Electric Light Company, Pekin Light Company, English Milling Company, Palmyra Light & Power Company and the municipal light plant at Birdseye. The two milling companies operate utilities in their respective towns.

The Nebraska Gas & Electric Company has purchased the lighting plant at Milligan, Fillmore County, from J. V. Kotes and F. A. Placek, who operated it with oil burners, and will connect the town to its 33,000-volt transmission lines.

Final action in the sale of the Adams Basin Power Company to the Rochester (N. Y.) Gas & Electric Corporation of Rochester, N. Y., was taken on Aug. 11. Customers of the Adams Basin company will be served direct from Rochester as soon as lines now being erected are completed.

Citizens of Marietta, Okla., voted on Aug. 10 by 325 to 2 to confirm the sale of the Marietta Light & Water Company to the Oklahoma Gas & Electric Company. The local company took over the municipal plant four years ago.

The town of Pioneer in Humboldt County, Iowa, has sold its municipal lighting plant to the Central Iowa Power & Light Company, which will furnish light and power from its main line.

Four more communities in Wisconsin formally turned over their electric properties and business to private companies when the Wisconsin Railroad Commission approved the sale of the municipal electric utilities at Greenwood, Milton, Loyal and Westby, involving a total sum of approximately $81,610. Greenwood, Loyal and Westby will be served henceforth by the Northern States Power Company and Milton by the Wisconsin Power & Light Company. All of these municipal plants have been wholesaling energy from these two private companies.

Gannett, Seelye & Fleming, Inc., Harrisburg, Pa., list the following merged groups of small properties as being under their management. Most of the local companies included are acquisitions of quite recent date:

Louisiana Public Utilities Company.—Leesville Light & Water Works Company; Republic Power & Service Com-

pany, De Ridder and Oakdale; Morgan City Ice & Electric Company; Franklinton Light & Power Company; Slidell Ice & Light Company; St. Tammany Ice & Manufacturing Company, Covington, Mandeville and Abita Springs; Selig-Davis Light & Power Company, Farmersville, and various ice plants.

Arkansas General Utilities Company.—Republic Power & Service Company, El Dorado, Warren and Smackover.

Missouri General Utilities Company.—Missouri Electric Power Company, Ste. Genevieve; Perry County Ice, Light & Power Company, Perryville; Bloomfield Electric Light & Power Company; Twin City Light & Power Company, Lutesville.

Oklahoma Northern Utilities Company.—Blackwell Electric High Line Company and various natural-gas companies.

Insull Properties in New Hampshire Are Merged

The Public Service Company of New Hampshire was incorporated at Concord on Aug. 16 to take over electric utilities in New Hampshire controlled by the Insull interests of Chicago. The companies involved are the Manchester Traction, Light & Power Company, the Keene Gas & Electric Company, the Laconia Gas & Electric Company and the Souhegan Valley Electric Company of Milford. Walter S. Wyman, Augusta, Me., is president. The company will issue 400,000 shares of preferred and 200,000 of common stock of no par value.

Pennsylvania Railroad Buys Power from Public Service

Electric service for hauling trains of the Pennsylvania Railroad between the Pennsylvania Terminal in New York and Manhattan Transfer, N. J., is now being supplied by the Public Service Electric & Gas Company of New Jersey over a new three-circuit connection from its Marion station. In order to make this capacity available it was necessary to install a second frequency changer at Marion as well as to change over several Hudson division substations from 25-cycle to 60-cycle service, and an outdoor transformer substation was constructed at Marion. The power is transmitted to the Pennsylvania Railroad right-of-way at a point near Snake Hill, N. J., by means of three 11,000-volt transmission circuits. Consumption of power over this connection by the railroad will exceed 3,000,000 kw.-hr. per month.

Fifty-two Oklahoma Towns Give Up Municipal Plants

Within five years 52 Oklahoma municipalities have given up the generation of electricity and have either granted franchises to private companies or are purchasing electrical energy under contract with private companies, according to a survey just completed by the Oklahoma Utilities Association, which proves its statement by printing an alphabetical list of the municipalities beginning with Afton and ending with Wynnewood.

Coal Reserves Are Normal

Bituminous Production 14 per Cent Over Last Year, Keeping Step with Fuel Oil and Water Power

BY PAUL WOOTON
Washington Correspondent
ELECTRICAL WORLD

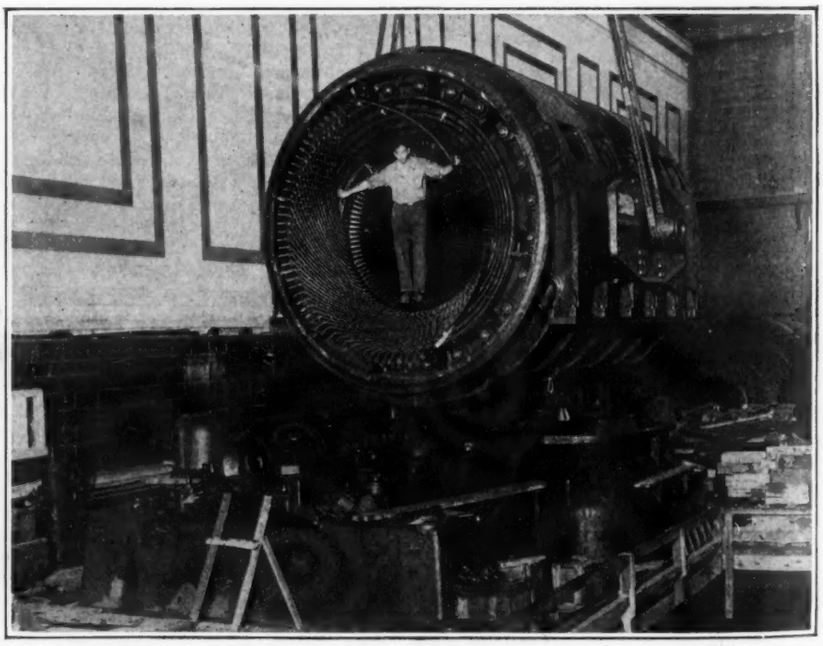
EXISTING stocks of bituminous coal, which were 39,000,000 tons on July 1, may be described as normal. This is virtually the same amount as was held by consumers on the corresponding date last year, but is very much less than the heavy reserves on hand in 1924, when consumers had not liquidated the stocks laid in in anticipation of a strike on April 1. It is now seen clearly that these large stocks were an important cause of the great depression in the coal market in 1924. Publication by the Bureau of Mines of these authoritative figures sets at rest the rumors based upon the figures of the National Association of Purchasing Agents, which at times show coal reserves to be abnormally high and at other times abnormally low.

This report makes it possible to calculate the rate at which coal is being consumed. Production of bituminous coal during the first half of 1926 ran 14 per cent ahead of production during the same period of 1925. Consumption of coal likewise has been greater—greater, in fact, than in any previous year. Though production is less than in 1918, a large part of the output in that year was going into storage, whereas in 1926 consumers have been drawing on storage. Actual consumption and exports of bituminous coal in 1918, allowing for changes in stocks, were 551,000,000 tons. During the first five months of 1926 the country was consuming and exporting coal at the rate of 555,000,000 tons for the year. This figure discounts the extra demand to replace anthracite during the long strike.

Figures show, too, that petroleum and water power have been used to a greater extent in 1926 than previously. The production of power from hydroelectric plants during the first five months of 1926 also happened to be 14 per cent greater than in the same period of 1925. Although the production of oil in 1926 has been running behind 1925, the deficit has been made up from storage. The total amount of oil consumed has been somewhat greater in the first half of 1926 than in the corresponding period of 1925. In spite of the fact that refiners are cracking further into the crude, there has been no decrease in the amount of fuel oil thrown upon the market. At the rate indicated by the figures for the first five months the amount of fuel oil and crude petroleum burned as fuel is the equivalent of 100,000,000 tons of coal. Fuel-oil prices are distinctly higher than last year. In July, 1925, it was selling in Oklahoma at 92 cents a barrel. At the end of July this year the Oklahoma price was $1.32 per barrel.

With coal, water power and petroleum all showing increased production, it is clear that the United States is producing more energy than ever before. The increase over 1913 is 35 per cent and that over 1918 is 13 per cent. These figures represent the consumption of energy-producing materials and do not refer to production. They allow for changes in stocks.

Lowering a 60,000-Kw. Turbo-Generator to Its Base



AS REPORTED in the ELECTRICAL WORLD for July 17 (page 134), the first unit for the New York Edison Company's new East River generating station is already in place and approaching completion. Its main part, suspended above its foundation, was photographed by the Keystone View Company. This 60,000-kw. turbo-generator weighs nearly 1,000 tons.

Iowa to Have Hydro-Electric Plant on Maquoketa

The Interstate Power Company is to have a hydro-electric plant on the Maquoketa River, 3½ miles south of Delhi, Iowa, H. C. Orton, vice-president and general manager, announces. The Utilities Light & Power Corporation, holding company for the Interstate, is constructing the plant, which is already under way, and it will be owned and operated by the Interstate as a unit of its system. An artificial lake, 10 miles long, covering nearly 1,000 acres, will be created by the dam, the crest of which will be finished as a county bridge. The dam will be nearly 55 ft. above the river level and its two approaches will be 750 ft. apart, necessitating a fill of 40,000 cu.yd. of dirt. Three steel floodgates, each 15 ft. high and 25 ft. long, will be automatically controlled by electricity to keep the lake at the required level.

The plant will have a 35-ft. effective head, developing 2,000 hp., two generators providing 750 kw. each. The power will be transmitted over the Interstate's 38,000-volt lines. The Maquoketa River plant will be second largest of the fourteen hydro stations owned by the Interstate, which, in addition to these water-power stations, now has five major steam plants and numerous auxiliary units.

Enlargement of the Dubuque plant of the Interstate is almost complete, at a cost of $750,000. A new turbine developing 10.000 kw., doubling the capacity of the local unit, has been placed in use, but is not yet operated at capacity.

No Special Session on West Virginia Water Power

A poll has been taken of the West Virginia Legislature in regard to calling a special session to act on the proposed water-power act. The vote was virtually unanimous against the proposal and the bill will therefore rest until next year.

The bill, some of the provisions of which have been previously explained in the ELECTRICAL WORLD, would place control of water-power development in the state in the hands of the Governor and the Public Service Commission, with the Circuit Court of Kanawha County and boards of arbitration of three members serving to settle controversial questions and, in the case of the court, to enforce the rulings of the commission. While the bill would give the power companies, after the commission had approved their development plans, almost absolute authority to take property, the proposed measure also provides that the power companies shall repay expenses and damages of removing roads, bridges, railway and interurban lines, telephone wires, gas and oil pipe lines and cemeteries and of taking private property, residences, etc. Riparian and water supply rights are protected by the bill, as is navigation.

Licenses would be granted for a period of 50 years, with renewal periods of not more than 50 years each. Revenue to the state would be 1 per cent a year of gross receipts, determined by the commission on a fair wholesale price for the power at point of generation. Development work, the bill provides, must begin two years after the licenses have been obtained and be completed within the three years following.

Site Chosen for Diablo Canyon Addition to Skagit Plant

The site for the masonry dam at Diablo Canyon, to be built at an estimated cost of $2,800,000 by the city of Seattle as a second unit in the Skagit River hydro-electric project, has been chosen, J. D. Ross, superintendent of the light department, states. The determining factor is a bed of hard granite 35 ft. below the surface of the river and extending for more than 400 ft. along its course. The dam will be 1,200 ft. high. Work will start as soon as materials and equipment can be moved to the site, this depending upon the completion of the railway extension from Gorge Creek, about 4½ miles. The City Council utilities committee has recommended that the railway work, which will cost $350,000, proceed at once.

A proposed city charter for Seattle which is to be voted on at the November election is strongly opposed by Mr. Ross, who declares that there is sufficient "dynamite" in this charter to wreck the city light and power plant inasmuch as the instrument provides that all unused moneys authorized for the yearly budget be turned into the general fund, making manipulation easy. Another provision prohibiting the lighting department from keeping its own records might, he says, make it difficult to lower rates, and a third provision which eliminates the section of the present charter authorizing the Council to sell utility bonds without the vote of the people is also, he holds, objectionable.

Three Years Necessary to Complete River Shannon Plant

According to information given out recently by the Power Section of the Department of Industry and Commerce of the Irish Free State, and quoted by United States Consul Ferris at Cork, a bulk supply of electricity from the projected hydro-electric development on the River Shannon will be available in the greater part of the Irish Free State in about three years' time. The scheme is to be developed in three stages: (1) Partial development, installation capacity 90,000 hp.; (2) further development, installation capacity 180,000 hp.; (3) final development, installation as in "further development," with additional storage.

A fall of 100 ft. is to be obtained by diverting the water from the Shannon at a point about 10 miles above Limerick and conducting it through a headrace canal, 7½ miles long, across the country to Ardnacrusha, which will be the site of the power house, Ardnacrusha is about 2 miles from Limerick. A weir is to be constructed in the riverbed at the point of diversion of the headrace to raise the level of the water approximately to the level of Lough Derg.

The excavation work for the power house, tailrace and headrace has been in progress since the early part of this year. It is being carried out by huge mechanical excavators operated by electric power generated by Diesel engines at a temporary power station. The earth excavated for the headrace will be approximately 10,000,000 tons. The power house will be of concrete construction and will comprise a dam, turbine house, generator and switch house. The penstocks will be steel pipes 20 ft. in diameter and 140 ft. long. For the partial development stage three turbo-generator sets, each of 30,000 hp., will be installed. One of these sets, when working at full load, will discharge about 90 tons of water per second.

The total expenditure is estimated at £5,200,000, of which about £2,500,000 is for construction work, £184,000 for mechanical installation and £1,700,000 for electrical installation, including all transmission lines. In June of this year 2,200 men were employed on the project.

Growth of Transmission Lines in Tennessee

A revised map corrected to July 1, 1926, has just been published by the Railroad and Public Utilities Commission of Tennessee showing all electric generating plants and high-voltage transmission lines used in public service in that state. Since June, 1924, when the first power map for the state was published by the commission, many changes have taken place. At that time there were no transmission lines west of the Tennessee River with the exception of a few miles extending out from Memphis.

Since then the Kentucky-Tennessee Light & Power Company has purchased the electric properties of a group of towns in west Tennessee and has connected up all of those towns by transmission lines from its steam generating plant at Martin. This company has also developed service for the rural districts. The Jackson Railway & Light Company has built transmission lines from Jackson to Brownsville, Whiteville and Humboldt. The Southern Cities Power Company has purchased several of the smaller utilities and has extended its transmission lines to serve them. The Tennessee Electric Power Company, the largest power company operating in the state, has acquired by purchase and shut down a large number of small electric plants operating in the smaller towns and has built transmission lines to serve these places.

The number of miles of transmission power lines in Tennessee on July 1 was approximately 2,500. The total number of customers served was approximately 190,000. About 94 per cent of the customers are served by privately operated utilities, while 6 per cent are served by municipally owned companies. The approximate population served by electric utilities is 880,000, or 37 per cent of the population. By consolidations the number of privately owned steam plants has been cut from 63 to 35 and of oil plants from 15 to 7. Privately owned hydro plants have increased from 19 to 23. There are still 19 municipal plants. The total rating of all power plants, private and municipal, is approximately 480,000 hp.

Power in British Columbia

Hydro-Electric Resources Put at Minimum of 1,900,000 Hp.—Half-Year Power, 5,000,000 Hp.

WATER-POWER resources of British Columbia have been a very important factor in the province's development. The Natural Resources Intelligence Service of the Dominion government has prepared a report on water-power development in the Pacific province which reads in part as follows:

"The Pacific area, which consists of the Province of British Columbia, is favored with an abundant rainfall, and the mountainous character of practically the whole province provides exceptionally high heads, some of them exceeding 2,000 ft. Three main mountain regions running north and south, the Coast Range on the West, the Rocky Mountains on the eastern boundary and the Selkirk Mountains to the west of the latter, insure great variety in precipitation as well as in temperature.

"The total available water power in British Columbia at minimum flow is estimated at 1,931,142 hp., and at 5,103,460 hp. dependable for six months. The power developed at the end of 1925 amounted to 414,702 hp. The undeveloped and unexplored nature of large areas of the province and the remarkable facilities for increasing power development through storage that, in many cases, have not been fully allowed for make it certain that the estimate of potential power given errs in being too conservative.

"Power development has reached its largest proportions adjacent to centers of population, principal among these being the districts around Vancouver, Victoria and Nelson. Much power is also developed primarily for industrial uses, mainly for mining and smelting, the manufacture of pulp and paper and for use in fish canneries. One of the most important power zones is located around Vancouver. Within a radius of 100 miles of the city it has been estimated that there is nearly 1,000,000 hp. dependable for six months in the year, and this does not include the many considerable sites on Vancouver Island. The British Columbia Electric Railway Company, which supplies electric power to this district, has now an installed capacity of 171,500 hp., and important additions that will largely increase this are under way at Allouette Lake and at Bridge River. The new Bridge River development, located at Seton Lake, 135 miles north of Vancouver, will be one of the largest on the continent. The ultimate development will be 700,000 hp., and power will be transmitted at 165,000 volts pressure, the highest so far in Canada. The city of Victoria and environs are supplied with water power by the same company that supplies Vancouver. Developments aggregating 29,600 hp. are used. One of these, on the Jordan River, utilizes a head of 1,145 ft.

"In the coastal region several large mining enterprises have developed power. At Britannia, on Howe Sound, north of Vancouver, the Britannia Mining & Smelting Company utilizes 22,350 hp., the most of which is developed under a 1,920-ft. head, and at Anyox the Granby Company uses 13,400 hp. On Vancouver Island Canadian Collieries (Dunsmuir) Limited have a 12,000-hp. installation on the Puntledge River. Many other mining companies scattered throughout the province have developed nearby water powers for use in mining and smelting operations.

"A wealth of forest resources has attracted many pulp and paper companies to British Columbia, and these find cheap water power one of the first essentials of their operation. Three such companies operate six mills in the province, the largest of which are the Pacific Mills, generating 26,850 hp. at Ocean Falls, and the Powell River Company, utilizing 24,000 hp. on the Powell River."

New York University to Train Leaders in Safety Work

In an effort to check the rising tide of industrial and public accidents and in response to the demand from all parts of the country for trained leaders in safety work, New York University, with the co-operation of the American Museum of Safety, will offer next month the first collegiate course in accident prevention, according to an announcement by Arthur Williams, president of the American Museum of Safety.

Citing reports from state and federal officials which show increases in industrial accidents ranging from 5 to 50 per cent in recent years and reports from cities throughout the country showing equally startling increases in street and home accidents, Mr. Williams declared that the decision of New York University to train men and women for leadership in accident prevention work is one of the most significant developments since the beginning of the safety movement.

"The fact that most accidents are preventable was demonstrated eighteen years ago," Mr. Williams said. "The methods of preventing accidents, both in industry and in communities, have become thoroughly standardized and detailed information concerning these methods—the combined experience of hundreds of companies and communities which have succeeded in reducing accidents from 25 to 75 per cent—is available to any one. The need now is for men and women with the qualities of leaders and organizers and with the training as safety engineers and public safety directors that will be offered by New York University."

The course in accident prevention will be given under the direction of C. W. Price, vice-president of the Elliott Service Company, formerly general manager of the National Safety Council. Other instructors will be Dr. E. George Payne, professor of educational sociology at New York University, formerly chairman of the educational section of the National Safety Council; W. Graham Cole, director of safety, Metropolitan Life Insurance Company, and Louis Resnick of the New York Edison Company, formerly editor of the *National Safety News* and director of publicity for the National Safety Council.

Briefer News

Pennsylvania Electric Association to Meet Sept. 8-10.—The annual convention of the Pennsylvania Electric Association (the state section of the N.E.L.A.) will be held at Bedford Springs, Pa., on Wednesday to Friday, Sept. 8 to 10 inclusive.

Power Sought from the Truckee.—Applications for 500 cu.ft. per second and 75,000 acre-ft. annually from the Truckee and Little Truckee Rivers for development of hydro-electric power and 75,000 acre-ft. from the same course for irrigation purposes have been filed with the State Division of Water Rights in California by C. B. Wheeler.

Federal Trade Commission's Report on General Electric Company.—Considering the limitations of personnel and appropriations, very satisfactory progress is being made on the investigation of the General Electric Company, the Federal Trade Commission states. It is expected that the report will be ready to submit to Congress when it convenes in December.

Illinois Power & Light's Danville-Champaign Line.—The Illinois Power & Light Corporation is pushing work on a 68,000-volt transmission line between Danville and Champaign, Ill., which it is building at an estimated cost of $218,000 to furnish additional power for the Champaign-Urbana district. Seventy-foot steel towers of four-legged type are half completed. They are spaced 800 ft. apart and carry aluminum cables. The line is expected to be in operation by Nov. 1.

Adirondack Company to Build Inghams Mills-Utica Line.—Officials of the Adirondack Light & Power Corporation announce that work on a transmission line from Inghams Mills, N. Y., to Utica will begin on Sept. 1 and that electricity generated at the East Canada Creek plant at Inghams Mills will be available in Utica by Nov. 1. The line will be 30 miles in length and will cost about $360,000. The Utica connection will be at the North Utica substation. Later the Utica-Inghams Mills line will be extended to Rotterdam, making a 11,000-volt connection through the east Mohawk Valley.

Rural Electrification in Georgia.—Plans for the electrification of the experimental farms of the Georgia State College of Agriculture at Athens, in order that the thousands of farmers and club members who visit them in the course of the year may learn of the practical uses to which electricity on the farm may be put, have been virtually completed, according to an announcement just made by Dr. Andrew M. Soule, president of the college. The announcement followed an address by H. M. Atkinson, chairman of the board of directors of the Georgia Railway & Power Company, which will supply the electrical equipment for the farms. Mr. Atkinson said that the recent merger of the Georgia Railway & Power Company

with the Southeastern Power & Light Company would insure ample power for use on the farms of the state and that the electrification of the State College farms at Athens was the first step in a campaign to introduce electricity on farms throughout the territory served by his company.

Selling Electric Refrigeration to Honolulu.—As the result of a visit to Honolulu by J. Robert Crouse of Cleveland a council of electrical refrigeration distributors may be organized in that city at an early date as a branch of the Society for Electrical Development. Mr. Crouse spoke to a luncheon gathering of interested business men on "Co-operation," dwelling especially on the important part in the electrical industry now played by refrigeration. The local press published an account of the meeting embellished by a group photograph.

Promises Energy at 1½ Cents a Kilowatt-Hour in an Indiana City.—An offer to supply Shelbyville, Ind., with electrical energy for power and lighting from a proposed plant on Flat Rock River, 9 miles south of that city, has been made to members of the City Council by C. C. Shipp of Indianapolis. Mr. Shipp, a former resident of Shelbyville, owns a number of farms along the Flat Rock and also owns water rights on the river. He has plans for a hydro-electric plant which will generate 2,000,000 kw. a year and offers to sell energy to Shelbyville at 1½ cents a kilowatt-hour. Building of a plant on the Flat Rock has been discussed for years, and surveys have been made before.

Electrical Women Have Eleven Organizations in Kansas.—Eleven organizations among women employees of the electric light and power industry of Kansas are now actively at work throughout that state, it is shown in the first report issued by Miss Ainslie Anthony, chairman of the woman's information committee of the Kansas Section, N.E.L.A. Ten of the clubs have been developed within the last three months. All are organized for the promotion of better public relations. Membership varies from five to fifty-two. The cities represented are Parsons, Lawrence, Pittsburg, Wichita, Newton, Arkansas City, El Dorado, Concordia, Fort Scott, Atchison and Topeka.

Virginian Railway's 134-Mile Electrification Nearly Finished.—Official announcement has been made that the work of electrifying the Virginian Railway between Roanoke, Va., and Princeton, W. Va., a project which was embarked upon about the first of the year, will be completed by Sept. 15 and that electrically operated locomotives may be expected to run into the Roanoke yards by that date. Completion of the project will give the Virginian a continuous electrified right-of-way from Elmore, near Mullens, W. Va., to Roanoke, a distance of 134 miles. Operation of electric trains began over the 36-mile stretch between Elmore and Princeton on Sept. 21, 1925. The entire electrification project, including the portion of the road between Princeton and Elmore, will cost the Virginian in the neighborhood of $15,000,000, according to an estimate by the Westinghouse Electric & Manufacturing Company, which furnished the electrical equipment and material for the locomotives and power line. The Charleston (W. Va.) court has denied an injunction against the railway asked by the Chesapeake & Potomac Telephone Company on the ground that the electrification would interfere with telephone circuits parallel and adjacent to the tracks.

"World's Largest" Copper Crystal.—The illustration shows Dr. T. A. Wilson of the research laboratory of the General Electric Company at Schenectady holding what is declared to be the largest single crystal of copper ever made. This crystal, somewhat resembling a projectile in appearance, is 17 in. long, 2¼ in. in diameter, and weighs slightly more than 12 lb. It was withdrawn from the electric furnace at a rate of ¼ in. an hour. This permitted the atoms of copper to arrange themselves regularly throughout the entire piece of metal. One of the outstanding properties of such single-crystal copper is that it will conduct electricity 13 per cent more efficiently than will ordinary copper, which is composed of tiny crystals in chaotic arrangement. Another unusual property of single crystals is that a rod of the metal can be bent easily. Having been bent, however, the single crystal is broken up into small crystals, and then it is as difficult to bend as is ordinary copper. Numerous experiments and investigations are being conducted in the General Electric research laboratory to determine the properties of single-crystal metals.

Mayor's Action Causes Hitch in Building Line to Little Falls, N. Y.—The Utica (N. Y.) Gas & Electric Company, has addressed an open letter to the citizens of Little Falls, pointing out the necessity of the Mayor signing the bill of sale for the former Erie Canal lands which the company claims it acquired from the city by purchase for a transmission line. The sale was authorized by a vote of the Common Council of Little Falls on May 24, vetoed by the Mayor and repassed over his veto. So far the Mayor has failed to carry out this express requirement of the resolution, and the construction of the company's line into Little Falls is at a standstill.

Edison's Birthplace Starts Movement for Technical College There.—Milan, Ohio, the native place of Thomas A. Edison, has announced its desire to become the site of a technical school. The village will donate 200 acres for this purpose, which will include the house where the inventor was born. A million dollars is named as the sum necessary to carry out the plans conceived.

New Hydro-Electric Plant for New Mexico.—A reservoir estimated to cost $350,000 is to be built in the Santa Fe canyon by the New Mexico Power Company, the company's application for 3,500 acre-feet of water a year having been approved by the state engineer. The dam will have a maximum height of 113 ft. It will be 747 ft. long and 10 ft. wide at the top. The application states that 450 hp. will be developed. Water will be used for domestic and irrigation purposes as well as for power.

New Plan for Short Meter Course at Ames, Iowa.—The electric meter short course to be held at Iowa State College, Ames, Sept. 20-24, will not embrace so much practical work as in the past. The students will be grouped principally in three classes, two of these arranged according to single-phase meter experience or polyphase meter experience, and a third class to consist of meter superintendents or those with considerable past experience. Special topics will be assigned for the last-named group.

Walsenburg (Col.) Plant to Be Enlarged.—The Trinidad (Col.) Electric Transmission, Railway & Gas Company has started construction on an additional power unit for its Walsenburg plant, to cost $300,000. A new power line between Big Four and Rouse is likewise part of an expansion program necessitated by demands of neighboring mines last winter, according to H. T. Dabney, Walsenburg manager of the company. The new machinery, a 6,000-kw. General Electric turbo-generator, will be put into operation next fall.

Progress in South Texas.—The 6,000-kw. generating plant which the Texas Central Power Company of San Antonio is building at San Benito at a cost of approximately $1,000,000 will be placed in service about Sept. 1, according to E. B. Neiswanger, general manager of the company. At Crystal City a small unit is being added to the company's power plant. Immediate construction of 17 miles of transmission line between Dilley and Cotulla has been ordered, and another high-tension line will be built from Cotulla into the heart of the Winter Garden district within the next few months.

Interstate Hydro-Electric Plants.—The Northern Electric Company, organized by the Northern Paper Mills Company as a public utility company, has been authorized by the Wisconsin Railroad Commission to purchase from the parent company dam sites on the Menominee River at Chalk River Rapids and White Rapids, where plants are being constructed to develop 10,000 hp.;

a tower-line right-of-way from White Rapids to Green Bay, and other property and privileges, for approximately $750,000. Power generated at these sites will be transmitted by the Northern Electric Company to Green Bay and other points in Wisconsin. As the sites will be partly in Wisconsin and partly in Michigan, one-half of the water power is subject to the Wisconsin recapture clause. The power house and other property, however, will be in Michigan, thus escaping the tax and legislative conditions prevailing in the neighboring state.

New Interconnections in Nebraska and Iowa.—Interconnection of the Nebraska Gas & Electric Company and the Nebraska Power Company is to be furthered by the construction of a 66,000-volt line from Plattsmouth, on the Missouri River, to Omaha, about 20 miles distant. A line from Plattsmouth now feeds the Lincoln Public Service Company, and other lines supply Nebraska Gas & Electric properties in western Iowa. Another coming development is the connection of Missouri Valley and Council Bluffs, Iowa, with a 30-mile high-tension line.

Improvements for Sioux City Plants.—W. J. Bertke, president of the Sioux City (Iowa) Gas & Electric Company, announces that the local plants are being improved at a cost of $176,000. A new substation at First and Court Streets, to house a bank of 10,000-kva. transformers, will cost $96,000. Another transformer station has just been finished at the Swift Packing Company's plant, and a third is under way to serve the city pumping station. These involve more than $38,000. In addition, a duplicate skip hoist is being installed at the Big Sioux power plant at North Riverside, to cost $42,000.

Re-electrification of South Shore Railroad in Illinois Completed.—Completion of the re-electrification program of the Chicago South Shore & South Bend Railroad has been announced with the beginning of operation of new steel passenger trains over the entire line from South Bend to Kensington. For a short time South Shore line trains will continue to be pulled from 115th Street and the Illinois Central right-of-way at Kensington to downtown Chicago by Illinois Central engines. That railroad, however, will in the near future begin operation of its electric trains from Kensington to the loop, and then South Shore line trains will be operated to the Randolph Street suburban station under their own power.

Hearing on Holston River Project.—Major Harold C. Fiske announces that a hearing will be held at the John Sevier Hotel, Johnson City, Tenn., on Friday, Sept. 10, in connection with the proposed hydro-electric development on the Holston River about 10 miles above Kingsport, Tenn. The Tennessee Eastern Electric Company is seeking a preliminary permit to construct in this river a gravity-type concrete dam about 100 ft. high with a spillway about 750 ft. long and a power house containing an installation of three 20,000-hp. units.

Expansion on Mississippi Power Company's System.—Construction of a 22,000-volt transmission line connecting all Mississippi coast cities, rebuilding of the 6,600-volt line between Gulfport and Pass Christian and its extension across a new bridge to Bay St. Louis, rebuilding of a similar line between Gulfport and Biloxi and its extension across the Iberville bridge to Ocean Springs, a new line from Ocean Springs to Pascagoula and Moss Point, reconstruction of transformer substations at Gulfport, Biloxi, Long Beach and Pass Christian and erection of new ones at Bay St. Louis, Moss Point, Pascagoula and Ocean Springs, besides increased boiler capacity and other improvements in the Gulfport steam plant, are included in an announcement by B. E. Eaton, president Mississippi Power Company, of extensions undertaken by that company, some of which are already under way. The local distribution systems will be rebuilt. This program is understood to be preliminary to beginning work on the 110,000-volt line which will run from Alabama hydro-electric plants and parallel the Gulf coast at some distance from it. This line when built will be tied in with the lower-voltage line at Gulfport and probably at Pascagoula.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

Association of Electragists International—Hotel Breakers, Cedar Point, Ohio, Aug. 24-27. L. W. Davis, 15 West 37th St., New York.

Camp Co-operation VI (local leagues)—Association Island, Henderson Harbor, N. Y., Sept. 1-4. (Society for Electrical Development, New York, is sponsor.)

Wisconsin Utilities Association, Electric Section—Eau Claire, Wis., Sept. 3 and 4. J. N. Cadby, 445 Washington Bldg., Madison, Wis.

American Institute of Electrical Engineers—Pacific Coast convention, Hotel Utah, Salt Lake City, Sept. 6-9. F. L. Hutchinson, 33 West 39th St., New York.

Illuminating Engineering Society—Essex and Sussex Hotel, Spring Lake, N. J., Sept. 7-10. L. H. Graves, 31 West 46th St., New York.

Pennsylvania Electric Association—Bedford Springs, Pa., Sept. 8-10. H. A. Buch, 212 Locust St., Harrisburg.

Rocky Mountain Division, N. E. L. A.—Glenwood Springs, Col., Sept. 13-16. O. A. Weller, Public Service Co., Denver.

New England Division, N. E. L. A.—Poland Spring House, Poland, Me., Sept. 20-23. Miss O. A. Bursiel, 149 Tremont St., Boston.

International Association of Municipal Electricians—Battery Park Hotel, Asheville, N. C., Sept. 21-24. E. H. Benz, West New York, N. J.

Great Lakes Division, N. E. L. A.—French Lick, Ind., Sept. 23-25. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

Wisconsin Chapter, Western Section International Association of Electrical Inspectors—Milwaukee, Sept. 27 and 28. Harvey Griem, City Hall, West Allis, Wis.

Association of Edison Illuminating Companies—Chateau Frontenac, Quebec, Sept. 27-Oct. 1. P. S. Millar, 80th St. and East End Ave., New York.

Public Utilities Association of West Virginia—Charleston, W. Va., Oct. 1 and 2. A. Bliss McCrum, secretary.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 4 and 5. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Cleveland, Oct. 4-8. J. W. Welsh, 292 Madison Ave., New York.

American Electrochemical Society—Hotel Washington, Washington, Oct. 7-9. C. G. Fink, Columbia University, New York.

North Atlantic Section, American Society of Agricultural Engineers—State College, Pa., Oct. 11-13—R. T. Wagner, 1 River Road, Schenectady, N. Y.

Kansas Section, N. E. L. A.—Manhattan, Kan., Oct. 14-16. H. Lee Jones, 401 National Reserve Bldg., Topeka, Kan.

Electrical Supply Jobbers' Association—Atlantic City, Oct. 18-22. F. Overbagh, 411 South Clinton St., Chicago.

Electric Power Club—Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Tennessee Eastern Electric Company Valued After Six Years.—The Tennessee State Railroad and Public Utilities Commission last week put a valuation on the properties of the Tennessee Eastern Electric Company for rate-making purposes of $2,500,000, the value of the depreciable property being placed at $1,750,000. The case has been before the commission ever since 1920, when the company asked a valuation.

Power Sought from Troublesome Creek.—Preliminary filing on a large water-power project for southeastern Snohomish County, Wash., has been made by D. W. Stevens of Seattle. Numerous surveys are yet to be made for this development and the full specifications are not available. The operations will be centralized near the town of Galena. An appropriation of 10 sec.-ft. of water is asked from the West Fork of Troublesome Creek, while a second 30 sec.-ft. appropriation is sought from the East Fork of the same Cascade Mountain stream. A third appropriation of 5 sec.-ft. of water from the Sultan River is sought in this application, which gave no indication of the capacity of the project or its estimated cost. The first of two reservoirs, to be known as the Twin Lakes Reservoir, would store 8,000 acre-ft. of water, while the second, to be known as Blanca Lake, would have a capacity of 20,000 acre-ft.

New Company Formed to Build Hydro Plant on the Guadalupe.—Construction of a hydro-electric plant on the Guadalupe River near Seguin, Tex., to cost $2,000,000, will be started soon by the Texas Power Corporation, according to F. H. Wilmont of Seguin, president of the company. In connection with the project three dams will be built across the river, one 4 miles below Seguin, another midway between Seguin and New Braunfels, and the third 12 miles below New Braunfels. The company, which has just been incorporated under the laws of Texas, has 10,000 shares of common stock and 4,000 shares of preferred stock. It is stated that arrangements have been made for the sale of $2,000,000 in bonds to Chicago bankers. The hydro-electric plant will have a capacity of 10,000 hp. The company has made a contract with the Comal Power Company, subsidiary of the San Antonio Public Service Company, for the sale and distribution of all the power developed by it.

Men of the Industry

Nathaniel H. Callard has been appointed assistant to the central-station sales manager of the Westinghouse Electric & Manufacturing Company, with headquarters in New York City. Mr. Callard is a native of Portland, Ore., attended school in Seattle and joined the Westinghouse forces at Pittsburgh in 1912. In 1916 he was sent to the Salt Lake office of the company on engineering work in connection with railway activities in that territory and remained there until the war. In 1919 Mr. Callard returned to East Pittsburgh as special representative of the railway department, and in 1920 he again went to Salt Lake City to handle railway and central-station problems and remained there until last November, when he was transferred East to the general sales department of the company in New York City.

Robert C. Leonard has been appointed head of the industrial department recently created by the Tennessee Electric Power Company. Mr. Leonard was formerly engaged in power sales and special commercial work in the statewide division of the Tennessee Electric Power Company which handles all business in the communities served outside of Nashville and Chattanooga. He is a graduate engineer and is well qualified by experience to carry on the important work of interviewing and interesting prospective manufacturers and mill owners and arranging for them to visit Tennessee so that they may go over the ground and obtain all information desired in detail.

Frank Leroy Blanchard is the new president of the Public Utilities Advertising Association. Mr. Blanchard is a graduate of Bates College and has a broad background of experience in the advertising field. Early in his career he engaged in newspaper work on the staff of the New York *Tribune*, the New York *Morning Telegraph* and the New York *Evening World*. After entering the advertising field through the Hampton and Seaman agencies, he attracted wide attention among business men for the constructive articles he contributed to advertising periodicals. He soon accepted an offer to become managing editor of *Printers' Ink*. It was in 1922 that he affiliated himself with the Doherty organization as director of public relations for the utility and oil properties of the Cities Service Company. Since his connection with Mr. Doherty, Mr. Blanchard has been active in all branches of public utility advertising work. He is a member of the Advertising Commission of the International Advertising Association, chairman of the publicity and advertising section of the American Gas Association and is a member of similar committees in the National Electric Light Association, the Society for Electrical Development and the American Electric Railway Association.

William J. Curtis, for a number of years in charge of public utility news on the *Wall Street Journal*, has become associated with the American Brown Boveri Electric Corporation and will be in charge of the company's statistical department.

H. E. Dralle of the Westinghouse International Company, specialist on the electrification of oil fields, is leaving New York on the United States liner *Leviathan* on Aug. 21 for a year's inspection tour of the oil fields of the world. Mr. Dralle is making this tour at the request of a number of foreign oil companies with a view to making recommendations regarding the electrification of foreign oil fields in accordance with the methods now in use in the United States. Mr. Dralle's travels will take him through England, France, Holland, Germany, Rumania, Poland, Russia, Persia, India and through the Far East.

L. J. Belnap New President of Worthington Corporation

LaMonte J. Belnap, who was elected president of the Worthington Pump & Machinery Corporation, as announced in the July 24 issue of the ELECTRICAL WORLD, has had a varied career in the electrical manufacturing field, having served in technical, sales and managerial capacities. Mr. Belnap attended the University of Nebraska and was graduated in 1898 with the degree of B. S. in electrical engineering. During his college course he was employed for four years in the summer vacations on survey and construction work on the Burlington Railroad in Montana and Wyoming, and soon after graduation he entered the employ of the Western Electric Company at Chicago as a student apprentice. He later became associated with the Wagner Electric Manufacturing Company of St. Louis, the Bullock Electric Manufacturing Company at Cincinnati and the Allis-Chalmers Company at Milwaukee and Montreal.

L. J. BELNAP

In 1911 Mr. Belnap left the Allis-Chalmers Company and became vice-president of the Rudel-Belnap Machinery Corporation, Ltd., of Montreal, retaining his interest in this company until he sold out in 1925. Simultaneously with his work in the Rudel-Belnap Company he organized, in 1914, the Ingersoll Machine Company, Ltd., of Canada, of which company he was president until 1920. From 1917 to 1919 he was managing director of the Williams Manufacturing Company, Ltd., of Montreal, and from 1919 to 1925 was president of the Rolls-Royce Company of America at Springfield, Mass. In 1925 and 1926 he was chairman of the board of the Wills Sainte Claire Company of Marysville, Mich.

A. H. Sammon has been appointed sales manager of the Pittsfield (Mass.) Electric Company, succeeding the late E. P. Dittman.

E. F. Roosa, formerly distribution engineer of the Consumers Power Company at Battle Creek, Mich., has been transferred to the Jackson district.

George Bakewell, Jr., is now executive manager of the Electrical League of Colorado, his appointment by league officers having been ratified by the advisory board. He succeeds the late Sidney W. Bishop, who was with the league from its inception in 1921. Mr. Bakewell became associated with the league two years ago as field representative under Mr. Bishop. Since the latter's death last May he has been handling the duties of both offices. A successor to Mr. Bakewell as field representative will shortly be appointed.

Walter W. Rose, formerly sales manager for the Coffield Electric Company, Cleveland, has been appointed manager of the appliance department of the Laube Electric Corporation of Rochester, N. Y. Mr. Rose is said to bring to his Rochester position a thorough knowledge of both the sales and manufacturing end of the business.

Dr. George Otis Smith, director of the United States Geological Survey, has been making a tour of the West, conferring with survey officials of the various states. He attended the Uinta basin industrial convention held at Fort Duchesne, Utah, where he delivered an address, as the personal representative of Hubert Work, Secretary of the Interior, on the subject "The Interest of the Interior Department in Utah."

Joseph O'Neill has been appointed manager of advertising and sales promotion for the Imperial Electric Company, Akron, Ohio, manufacturer of alternating-current and direct-current motors and generators. Mr. O'Neill had been connected with the Goodyear Tire & Rubber Company for the past ten years as department manager of merchandising projects.

Obituary

John H. Chase, district manager for the Iowa Southern Utilities Company at Burlington, Iowa, died very suddenly on Aug. 14. Mr. Chase had been connected with the Iowa Southern Utilities Company since 1913, first at Centerville, Iowa, later being transferred to Creston. When the utility corporation took over the Walsh interests at Burlington two years ago, he was sent there as general manager. Under his direction the properties began to grow rapidly. Mr. Chase was a native of Marysville, Ohio, and was 50 years of age.

Recent Court Decisions

Powers and Purpose of State Regulating Bodies.—The Supreme Court of Utah, in a suit over the regulation of motor vehicles (Gilmer vs. Public Utilities Commission of Utah), said: "Every public utility necessarily must operate in accordance with both the letter and the spirit of the public utilities act and the authorized conditions imposed by the commission. The very purpose of the utilities act is to prevent one public utility from destroying another. . . . The commission undoubtedly may interfere to prevent such disastrous results [as arise from unrestricted competition]. The commission was created for that very purpose, and where its orders are within its jurisdiction and the bounds of reason and are not capricious and arbitrary, this court cannot interfere." (247 Pac. 284.)*

Damages Cannot Be Recovered Because of Company's Negligence Where Danger Was Knowingly and Needlessly Run.—A pole belonging to the Rome Railway & Light Company was broken off at the ground and fell, carrying heavily charged wires with it. In a suit brought against the company the plaintiff (Little) charged that the pole fell because it was rotten and that the death of the plaintiff's father, who came into contact with the wires, was due to the company's gross negligence in allowing such a pole to remain on a highway. The Court of Appeals of Georgia affirmed a judgment for the defendant, saying that the victim was guilty of contributory negligence since he had been told of the fallen wires and could with ordinary care have avoided danger, but nevertheless needlessly encountered it on a dark, wet night. (133 S.E. 643.)

United States Supreme Court Answers Objections to Federal Injunctions Against Confiscatory Rates.—Declaring that unreasonable delay by a commission in not acting on an application for a schedule of increased rates, which application it has treated as pending after a permanent order annulling the schedule has been reversed on appeal and the cause remanded for further proceedings, although a prior schedule of confiscatory rates (pending when the schedule for increased rates was filed and purporting to be canceled by the schedule for increased rates) has been approved, leaves the company with no remedy which it is required to exhaust before proceeding in a federal court for injunctive relief, the United States Supreme Court (in Frank L. Smith vs. Illinois Bell Telephone Company) said further that a decree enjoining a commission from action which would result in the imposition of confiscatory rates is not objectionable as an attempt to bind subscribers not parties to the suit, since the commission represents the subscribers and the public. Nor is such a decree subject to the objection that it prohibits the commission from preventing excessive charges in the future, where there is nothing in the decree, if rightly construed, which attempts to curtail the power thereafter to proceed to fix rates under the state law except as the doctrine of *res judicata* may apply.

Minimizing Damages Due to Breach of Contract.—In a suit brought by the city of Paragould against the Arkansas Light & Power Company for a breach of contract to furnish electric power, the Supreme Court of Arkansas found that the burden of proving amount of damages rested on the city and the burden of showing that these should have been minimized on the company. The city was not bound to accept an offer which would have involved the expenditure by it of $6,000, with no reduction of rates, in order to minimize the damage caused by the breach. (284 S.W. 529.)

New Rate Schedule Not to Be Filed During Hearing on Suspended Schedule.—A suit over gas-lighting schedules brought against the Public Utilities Commission of Ohio by the Logan Gas Company has brought from the Ohio Supreme Court a ruling that when the Public Utilities Commission has, pending hearing, suspended the operation of a schedule of rates and the utility company concerned has filed a bond to protect its customers, the new rates go into effect at the end of the period of suspension and the utility company cannot during the hearing file a new schedule. (152 N.E. 648.)

Negligence of Company in Maintaining Uninsulated Line Properly Submitted to Jury.—Affirming a verdict of $20,000 in Burrows vs. the Livingston-Niagara Power Company, in a damage suit brought because of the death of a workman who in removing refuse ran a 25-ft. iron pipe through a broken pane of a factory window made so that it would not open and was killed by the contact of the pipe with an uninsulated power line of the defendant, the Supreme Court of New York said that it was not necessary for the jury to find that the company should have apprehended this kind of an accident. "The question is, Should the defendant have anticipated, in the exercise of reasonable care, that the line as constructed constituted a menace and danger to people lawfully upon the premises? Is it so unreasonable to say that an employee of the factory might in some way cause something to come in contact with the live wire and thereby cause an injury that the court can say as a matter of law that such construction was not negligent?" By a majority of three to one the court held that the fact that the defendant constructed and maintained an uninsulated 11,000-volt line along the side of a factory, less than 4 ft. from the building on one end and 8 ft. on the other, presented a question of fact as to negligence which was properly submitted to the jury. (216 N.Y.S. 516.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Prepayment Meters for Delinquents.—The use of a prepayment gas meter with an adjustment to require a deposit of more than the legal rate so that the excess will be applied to an overdue account was held by the Wisconsin Railroad Commission in a case affecting the Wisconsin Fuel & Light Company to be reasonable and not unjustly discriminatory, when notice in writing is given the delinquent three days before installing the meter, containing an itemized statement of the amount due, stating the rate at which the prepayment device will be set, and calling to the attention of the delinquent that he can avoid the setting of the meter by paying the bill or by discontinuing service.

Applicant for Restoration of Service Properly Discontinued Must Be Bona-Fide New Patron.—The Union Electric Light & Power Company was not required by the Missouri Public Service Commission to restore service that had been cut off because of an unlawful diversion of energy and failure to pay for the estimated diversion and for the cost of installing a lock box over the meter to prevent future diversion, although the son-in-law of the original user made application for the restoration as a new patron. It appeared from the conflicting evidence that the change in the titular head of the household had not changed its identity, and the commission held that the application was not from a bona-fide new patron.

Unprofitable Street-Railway Department Excluded from Utility Merger.—The Nebraska State Railway Commission, giving its approval to the general plan of the Continental Gas & Electric Corporation for the consolidation of the Lincoln Traction Company and the Lincoln Gas & Electric Company, the transportation properties of the Lincoln Traction Company being excluded from the merger as less prosperous, held that a contract to sell power to the street railway at a basic price which was less than the existing cost of production but which price might change as the cost of steam coal increased or decreased, and which not only gave the commission authority to approve when a change other than in the coal clause was submitted by the parties but authorized an investigation on the commission's own motion at any time, was in the public interest. Inasmuch as the consolidation reduced street-railway operating expenses by reducing the cost of power, decreasing the salaries of general officers and legal expenses and decreasing the amount of taxes, and, on the other hand, increased the street-railway gross revenue by transferring to that department electric railway customers from the consolidated electric department, it was held to be, with proper assurance of continuance of street-railway operation, in the public interest.

Financial and Corporate

Utility Market Higher

Moderate Gains Exceed the Losses in Trading as Position of Money Tightens

THE action of the Federal Reserve Bank of New York in raising its rediscount rate from 3½ to 4 per cent, thus putting the local rate for doing business in line with that maintained at the other eleven institutions, was the event of outstanding importance in the investment markets of the week. This move was taken as a logical step in view of the recent gradual rise in the price of money, but not until the Federal Reserve Board took action did Wall Street fully appreciate the extent of the change that had been going on.

Down to the present time the increase in the rediscount rate has brought no perceptible change in the market for power and light stocks, although the bulls insist that the action portends better business and is therefore a favorable sign. While the market continues to display a firm tone, the advances for the week under review were modest.

A 5⅛-point gain in the price of the General Electric shares was the most important advance among the stocks of the electrical group listed on the New York Stock Exchange. In the unlisted or over-the-counter market the 3¾-point advance in the shares of the Commonwealth Edison Company and the 2¼-point advance in American Gas & Electric were the most conspicuous changes on the upside. Gains of approximately a point were scored by Central Power & Light preferred, Tennessee Electric Power preferred, Associated Gas & Electric A stock and the Electric Bond & Share Corporation's stock. Duke Power fell 5 points.

Staten Island Edison Issues Annual Report

The effect of service extensions and building of new business of the Staten Island Edison Corporation, one of the properties of the Associated Gas & Electric System, is shown in the 1925 report just made public. The corporation and its subsidiaries report gross revenue from all sources amounting to $3,065,743 as compared with $2,768,661 in 1924, an increase of $297,082. After operating expenses, taxes and rentals, and after reserves for replacements and renewals, gross income was $885,843 as compared with $756,367 in 1924, a gain of $129,476. Total interest and amortization of debt discount and expense amounted to $274,962 against $352,568 in 1924, leaving net income of $610,882 against $403,799, an increase of $207,083. Total assets of Staten Island Edison and subsidiaries as of Dec. 31, 1925, are shown to be $26,090,536, the properties, with plant and investment, representing appraised reproduction cost at Dec. 31, 1922, plus subsequent net additions at cost, amounting to $21,076,057. Current assets totaled $4,446,541 against current liabilities of $1,706,510.

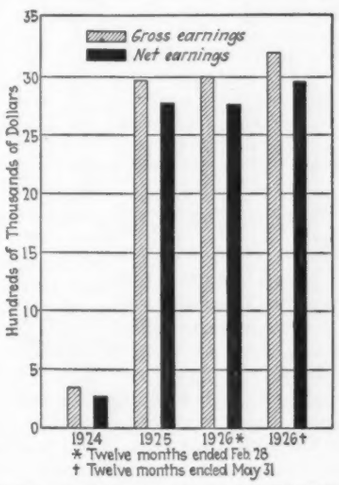
The only electric light and power company in Richmond Borough, Staten Island, the Edison corporation attained new high records in service improvements, number of customers and in construction activities. Charles S. Banghart, vice-president and general manager, reported as outstanding among these achievements the addition of a new 20,000-hp. steam turbo-generator at the thoroughly modernized Livingston power house of the company; beginning of service to the Staten Island Rapid Transit Company, subsidiary of the Baltimore & Ohio, incident to the electrification of its lines on the island; the erection of a new boiler house containing three 300-lb.-pressure Connell boilers, each of which is capable of developing 5,000 hp.; construction and completion of four new substations at Clifton, Eltingville, Arlington and Atlantic. The growth of the company is further shown by the addition of 2,467 customers, bringing the total served as of Jan. 1, 1926, up to 30,041.

Electric Investors, Inc., Diversifies Risks

This Investment Concern Does Not Own More than 6 per Cent of Total Stock in Any One Company—Annual Gross Revenues Now Total $3,185,000

By Paul Willard Garrett
Financial Editor *New York Evening Post*

ORGANIZED in its present form on Dec. 1, 1924, Electric Investors, Inc., steadily has grown in strength as an investment company. S. Z. Mitchell, president of Electric Investors, Inc., in the 1925 annual report, described the character of the organization as follows: "The revenue of the company is derived from dividends and interest upon its investments, commissions received in connection with financial transactions and profits realized from sale of securities owned. The company does not engage in the brokerage business. It is not a holding company. It is an investment company seeking stability, safety and profit through diversity along lines generally followed for years by the successful insurance companies and the English and Scottish investment trusts."



Gross and Net Earnings of Electric Investors Since 1924

On the date of the most recent report, Mach 31, 1926, Electric Investors, Inc., owned less than 6 per cent of the total stock of any one company. In endeavoring to diversify its risks the company does not confine its investments to the securities of the power and light companies but invests as well in such unrelated fields as insurance, banking, industrial and other companies. Its folder contains utility common stocks primarily, but the list includes also Atchison, Topeka & Santa Fe common, United States Steel common, Hudson Motor and United States Rubber.

That the company under the eye of the Electric Bond & Share president has shown unusual growth, notwithstanding its wide diversity of risks for the protection of stockholders, is revealed by the rise in annual revenues from $341,184 for the twelve months ended Dec. 31, 1924, to $3,184,979 for the twelve months ended May 31, 1926. Earnings for the 1924 period, which preceded the formation of the present Electric Investors, Inc., represent the consolidated earnings of the former Electric Investors, Inc., and the Electrical Utilities Corporation, which were consolidated in the formation of the present company.

From gross revenues of $3,184,979 for the twelve months ended May 31, 1926, the management was able to show no less than $2,930,817 as net earnings available for the stock. The company has no funded debt. Of that total the seven-dollar preferred and six-dollar preferred stocks took $450,369 in dividends, leaving $2,480,448 available for the common and reserves.

Capital stock outstanding on May 31, 1926, was as follows: 32,395 shares of seven-dollar preferred stock, 50,000 shares of the six-dollar preferred and 778,858 shares of common. There were also option warrants to buy the common stock at $20 a share outstanding to the amount of 24,205 shares.

Bonds Designated as Legal Investments for Massachusetts Banks

The complete list of public utility bonds designated by the Massachusetts Commissioner of Banks as legal investments for savings banks and trust funds under an amendment adopted by the last legislature has been made public. The following electric light and power securities are included:

Edison Electric Illuminating Company of Brooklyn first consolidated 4s, 1939.

Kings County Electric Light & Power first 5s, 1937.

Brooklyn Edison A 5s, 1949, and B 6s, 1940.

Central Maine Power first 5s, 1939; first and general A 7s, 1941; first and general B 6s, 1942; first and general C 5½s, 1949, and first and general D 5s, 1955.

Cleveland Electric Illuminating first 5s, 1939.

Commonwealth Electric first 5s, 1943.

Commonwealth Edison first 5s and 6s, 1943.

New Milford Power first 5s, 1932.

Connecticut Light & Power first and refunding A 7s, 1951; B 5½s, 1954, and first and refunding C 4½s, 1956.

Grand Rapids-Muskegon Power first 5s, 1931.

Michigan Light first and refunding 5s, 1946.

Pontiac Light first 5s, 1927.

Consumers Power first lien and refunding 5s, 1926.

Kansas City Power & Light Company first A 5s, 1952.

Los Angeles Electric Company 5s, 1928.

Los Angeles Gas & Electric Company general 5s, 1934.

Los Angeles Gas & Electric Corporation first and refunding 5s, 1939; general and refunding B and C 7s, 1931; general refunding D, G and H 6s, 1942; general and refunding E 5½s, 1947; general and refunding F 5½s, 1943, and general and refunding I 5½s, 1949.

New York & Queens Electric Light & Power Company first consolidated 5s, 1930.

Ashland Gas & Electric Light first 5s, 1929.

Massillon Gas & Electric first 5s, 1956.

Richland Public Service first 5s, 1937.

Sandusky Gas & Electric first 5s, 1929, and first refunding and improvement 5s, 1945.

Trumbull Public Service first 6s, 1929.

Ohio Public Service first mortgage and refunding A 7½s, 1946, and B 7s, 1947, and first mortgage and refunding C 6s, 1953, and D 5s, 1954.

San Diego Consolidated Gas & Electric first 5s, 1939; first and refunding A 6s, 1939, and first and refunding B 6s and C 6s, 1947.

Western New York Utilities Company first 5s, 1946.

The Massachusetts list omits a number of issues which had been expected to qualify. It is expected that some of these will be included when certain requirements have been complied with.

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Buffalo, Niagara & Eastern Power	.25	.....
Central Illinois Publ. Serv., pf	1¾	Oct. 15
Central Indiana Power, pf.	1¾	Sept. 1
Laclede Gas Light, com.	2	Sept. 15
Middle West Utilities, pr. ln. cap.	$2.00	Sept. 15
Municipal Service, com.	.25	Sept. 1
National Public Serv. cl. A	.40	Sept. 15
Nebraska Power, pf.	1¾	Sept.
North Carolina Pub. Serv., pf.	1¾	Sept. 1
Oklahoma Gas & Elec., pf.	1¾	Sept. 15
Pinellas County Pwr., 7% pf. A.	1¾	Sept. 1
Pinellas County Pwr., 7% cum. pf.	.87½	Sept. 1
Public Service Corp. of N. J., com.	$1.25	Sept. 30
Public Serv. Corp. of N. J., 8% pf.	2	Sept. 30
Public Serv. Corp of N. J., 7% pf.	1¾	Sept. 30
Public Serv Corp of N. J., 6% pf.	1½	Sept. 30
Public Service Elec. & Gas, 7% pf	1¾	Sept. 30
Public Service Elec. & Gas, 6% pf.	1½	Sept. 30
Radio Corp. of America, pf	1¾	Oct. 1
Southern Colorado Power, pf.	1¾	Sept. 15
Utica Gas & Elec., pf	1¾	Aug. 16

Rochester Utility to Issue Stock.—Directors of the Rochester Gas & Electric Corporation of Rochester, N. Y., at a meeting held on Aug. 11 authorized the issuance of $3,680,000 in preferred stock early this fall, following the consent of the Public Service Commission to the issue.

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Aug. 17	Low 1926	High 1926
ABITIBI PWR. & PAPER, com.—no par	85½	70¾	84½
Adirondack Pwr. & Lt.—7% pf.	108	....	....
Adirondack Pwr. & Lt.—8% pf.	112	....	....
Ala. Pwr., pf.	105½	....	....
Allis-Chalmers Mfg. pf.	k109	105	110½
Allis-Chalmers Mfg., com.	90	78½	94¾
Aluminum Co. of Amer., com.	71	54¾	76
Aluminum Co. of Amer. new, pf.	101	....	....
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	k 90	88½	98
Amer. & Foreign Pwr., com.—no par	20½	15½	42¾
Amer. Bosch Magneto, com—no par	19½	16	34¾
Amer. Brown, Boveri, Elec.	48¾	30½	50
Amer. Brown, Boveri, Elec., pf.	97	86½	97½
Amer. Elec. pwr., pf.	m111	102	111
Amer. Gas & Elec., 6% pf.—no par.	94½	90½	95½
Amer. Gas & Elec., com.—no par.	97	64	99½
Amer. Lt. & Trac., 6% pf.	106½	105	115½
Amer. Lt. & Trac., com.	218	195	263
Amer. Pwr. & Lt., 6% pf.	k 96	92	97
Amer. Pwr. & Lt., com.—no par.	69¾	45	80
Amer. Pub. Serv., 7% pf.	c 97	92	99
Amer. Pub. Serv., com.	50	45	80
Amer. Pub. Utilities, 6% pf.	85	....	....
Amer. Pub. Utilities, 7% pf.	95	....	....
Amer. Pub. Utilities, com.	77	....	....
Amer. States Sec., A	3	....	....
Amer. States Sec. B	2½	....	....
Amer. Superpwr., pf.—25	k 25½	23	26¾
Amer. Superpower, pf.	l 93¾	....	....
Amer. Superpwr., Class A—no par.	k 32½	19½	37¾
Amer. Superpwr., Class B—no par.	31½	21½	39
Amer. Wtr. Wks. & Elec., 7% pf.	104½	101½	108½
Amer. Wtr. Wks. & Elec., com.—20.	60	43¾	74
Anaconda Copper	51	41½	51¾
Appalachian Pwr., 7% pf.	98	99	101
Appalachian Pwr., 1st pf., 7%	98	99	102
Appalachian Pwr., com.	78	78	83
Arizona Pwr., 7% pf.	64	....	....
Arkansas Cent. Pwr., pf., $7—no par	k104	99	107
Arkansas Lt. & Pwr., 7% pf.	101	....	....
Arkansas Lt. & Pwr., com.	101	101½	102
Asheville Pwr. & Lt., 7% pf.	l106½	100½	107½
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—$6—no par	82½	....	....
Assoc. Gas & Elec., Class A—no par	36½	25½	36½
BABCOCK & WILCOX, com.	118½	....	....
Birmingham Elec. pf.—$7—no par	103	....	....
Blackstone Valley Gas & Elec., pf.	103	103	106
Blackstone Valley G.&E., com.—50.	98	....	....
Blaw-Knox, com.	f 60	45	60½
Brazilian Trac., Lt. & Pwr., com.	f112½	....	....
Broad River Pwr., pf.	93	....	....
Brooklyn Edison, com.	151	133	159
Buffalo, Niagara&East.Pwr.,pf.—25	24½	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par	l 31	....	....
CALIFORNIA ELEC. GENERATING, pf.	92	95	9
California Ry. & Pwr., pf.	90	88	11
Carolina Pwr. & Lt., pf.—$7—no par	107½	104	107
Cent. & S. W. Ut. 7% pf.—no par	a 93	89½	96
Cent. & S. W. Ut., pr. ln. pf.—no par	a 97½	93	100
Central Ariz. Lt. & Pwr., pf.	104	....	....
Central Ark. Ry. & Lt., 7% pf.	k 98	99	99½
Central Ill. Pub. Serv., 6% pf.	a 88½	87	91
Central Ind. Pwr., 7% pf.	85	85	93½
Central Pwr. & Lt., pf.	97½	....	....
Central States Elec., 7% pf.	91	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	m115	110	116
Chicago Fuse Mfg., com., no par	a 31	30	35
Cincinnati Gas & Elec., com.	g 89½	88	95
Cities Service, 6% pf.	l 89¾	86¾	89¾
Cities Service, pf.B—10	l 7⅞	7⅞	7⅞
Cities Service, pf. BB—100	l 77½	74	79
Cities Service, com.—20	l 44	37½	44
Cities Service, Bks. Shrs.—10	l 22	19½	22
Clarion River Pwr., pf.	93	93	95
Cleveland Elec. Illg., 6% pf.	105	....	....
Cleveland Elec., Illg., com.	k295	240	310
Colorado Pwr., 7% pf.	k 95	96	97
Columbia Gas & Elec., 7% pf.	k115	112	115½
Columbia Gas & E., com.—no par.	82½	63½	90
Columbia Ry., Gas & Elec., 6% pf.	90	65	96
Columbus Elec. & Pwr., 2d pf.	104	....	....
Columbus Elec. & Pwr., com.	275	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	99	....	....
Columbus Ry., Pwr. & Lt., pf. B.	93½	....	....
Col. Ry., Pwr. & Lt., com.—no par.	65	....	....
Commonwealth Edison, com.	a136½	135½	145
Commonwealth Pwr., 6% pf.	87½	82	88½
Commonwealth Pwr., com—no par.	40	28½	42½
Conn. Lt. & Pwr., 8% pf.	117	....	....
Conn. Lt. & Pwr., 7% pf.	109	....	....
Cons. Gas of N. Y., pf.—50.	59½	....	....
Cons. Gas of N.Y., com.—no par	110½	87	115½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	k104	102	105
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	e111	108½	111½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	e113	109	113½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e127½	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	e 56½	45	57½
Cons. Pwr. & Lt., 7% pf.	104	....	....
Consumers Pwr., 6% pf.	97½	....	....
Consumers Pwr., 6.6% pf.	104	....	....
Continental Gas & Elec., 7% ptc. pf	101	....	....
Continental Gas & Elec., 7% pr. pf.	96½	....	....
Continental G.&E., com.—no par.	140	....	....
Croker Wheeler, com.	19	....	....
Croker Wheeler, pf.	54	....	....
DALLAS PWR. & LT., 7% pf.	105½	....	....
Dayton Pwr. & Lt., 6% pf.	100	....	....
Detroit Edison, com.	135	123½	141¾
Dubilier Condenser & Rado, com.—no par.	7½	4½	11
Dubuque Elec., 6% pf.	94	93	98½
Duquesne Lt., 7% pf.	114½	111½	116½
EAST, N. Y. UTIL. pf.	102	80	104
Eastern New York Util., com.	65	70	75
Eastern States Power	16	....	....
Eastern States Power, pf.	k 87	89	95
Eastern Tex. Elec., 7% pf.	103	....	....
East. Tex. Elec., com.—no par.	75	70	80
Edison Elec. Illum. of Boston, com.	d229½	207	250
E. Paso Elec., com.—no par.	70	70	94
E. Paso Elec. pf.	103	....	....
Elec. Bond & Share, 6% pf.	l107½	103½	109½
E. Bd. & Share Sec., com.—no par.	l 72½	56½	86
El. Household Util.	a 15	13½	25
Elec. Investors, 6% pf.—no par.	92	....	....
Elec. Investors, com.—no par.	45½	30¾	74½
Elec. Investors, 10% pd. receipts.	20	12	56
Elec. Pwr. & Lt., ctfs, pf.	96½	89½	97½
Elec. Pwr. & Lt., ctfs., 40% pd.	k104½	99½	115
Elec. Pwr. & Lt., ctfs. full pd.	m105½	....	....
Elec. Pwr. & Lt., ctfs., com—no par.	19½	15½	34½
Elec. Ry. Securities, com.—no par.	6	4½	10
Elec. Refrig.	66½	61½	78½
Elec. Storage Battery, com.—no par.	90½	71½	91½
Elmira Wtr., Lt. & R. R., 7% pf.	99	97½	99½
Emerson Elec., pf.	m101	100	104½
Empire Dist. Elec., 6% pf.	l 88	82	88
Empire Power, A	26½	21	32
Engr. Pub. Serv., pf.—no par.	m 96	87	96
Engr. Pub. Serv., com.—no par.	m 24	24	29½
Eureka Vac. Cleaner, com.—no par.	52½	43	56
FAIRBANKS MORSE, pf.	k109½	108½	115
Fairbanks Morse, com.—no par.	k 53	46	59½
Federal Lt. & Trac., com.	33	28	39½
Federal Light & Traction, pf.	m 88	86	89
Federal Utilities, pf.	70	....	....
Federal Utilities, com.	17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	l107	105	108½
GALVESTON-HOUSTON ELEC., 6% pf.	45	....	....
Galveston-Hstn. El., com.	16	....	....
Gen. Elec., com.	93½	79	95½
Gen. Elec., special—10	11½	11	11½
Gen. G.&E., (Del.) com. A no par.	51	34	59
Gen. G.&E., (Del.) com. B no par.	48	45	48
Gen. G.&E., (Del.) A pf. $8 no par.	k106½	105½	110½
Gen. G.&E., (Del.) A pf. $7 no par.	97½	95	99½
Gen. G.&E., (Del.) pf. B	k 93¾	92½	96
General Public Service, pf.	m104	90	106½
General Public Service, com.	k 12½	12½	16½
Ga. Lt., Pwr., & Rys., 6% pf.	94	82	96
Ga. Lt., Pwr. & Rys., com.	70	70	72
Ga. Ry. & Power, 8% pf.	113	....	....
Ga. Ry. & Power, 7% pf.	104½	....	....
Ga. Ry. & Pwr., 4% pf.	k120	105	145
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	h100	....	....
IDAHO PWR., 7% pf.	103½	104	104
Ill. No. Utilities, 6% pf.	a 91	90	92
Ill. Pwr. & Lt., 7% pf.	99½	....	....
Ingersoll Rand	94	80½	105
Int. Combus. Engr., com.—no par	56¾	33½	64½
Int. Utilities, class A—no par.	k 30½	31	39
Int. Utilities, class B—no par.	4¾	4½	9¾
Interstate Pwr., pf., no par.	92	....	....
Interstate Pub. Serv., 7% pf.	97	96½	99
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT., 7% pf.	95	....	....
Jersey Central Pwr. & Lt., ptc., pf.	109	110	112
Jersey Central Pwr. & Lt., com.—no par	45	45	50
Johns-Manville, com.—no par.	148	....	....

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Saturday, Aug. 14. lBid, low, high, Wednesday, Aug. 18. mLatest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Aug. 17	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf.	k110	107¼	112¼
Kansas Gas & Elec., 7% pf.	l102½	99	103
Kentucky Hydro-Elec., pf.	a 95½	91½	95½
Kentucky Sec., $6 pf.	80	....	....
Kentucky Sec., com.	100	....	....
Kentucky Utilities, 6% pf.	a 52½	49	52½
Keystone Pwr. & Lt. 7% pf.	96	95	97
LACLEDE GAS LT., com.	k161½	146	175½
Lehigh Pwr. Sec., com.—no par	17½	10	23
Long Island Ltg., 7% pf.	108	....	....
Long Island Ltg., com.—no par	120	120	150
Los Angeles Gas & Elec., 6% pf.	97	....	....
Louisville Gas & Elec., Class. A	24½	22½	26½
MANHATTAN ELEC. SUPPLY.	84½	56	87½
Manila Elec., com.—no par	k 33½	27½	39½
Maytag Mfg., com.	23½	19	24½
Memphis Pwr. & Lt., pf., $7, no par	105	103	107
Metro. Edison, pf.—$6—no par	93	....	....
Metropolitan Edison, pf., $7, no par.	103	....	....
Metropolitan Edison, com., no par.	45	45	50
Middle West Utilities, 7% pf.	a107	97½	111½
Middle West Utilities, 7% pr. lien p.	a117	106½	123½
Middle West Utilities, com.—no par.	a113½	108	134½
Midland Utilities, pr. ln. pf.	a102	98	104
Midland Utilities pf. A	a 99	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	101	....	....
Milwaukee Elec. Ry. & Lt., 6% pf.	93	....	....
Minn. Pwr. & Lt., 7% pf.	l103½	100	104
Miss. Pwr. & Lt., pf.	105	....	....
Miss. River Pwr., 6% pf.	95	....	....
Miss. River Pwr., com.	60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	101½	103	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	99	....	....
Mohawk Hudson Pwr., com.—no par	24½	20½	28½
Montana Pwr., pf.	m117½	112½	119½
Montana Pwr., com.	79½	69½	83½
Montreal Pwr., com.	f235½	....	....
Mountain States Pwr. pf.	97	....	....
Mountain States Pwr., com.	18	....	....
NASSAU & SUFFLOK, LTG., pf.	98	....	....
National Carbon, pf.	a126½	125	128
National Elec. Pwr., pf.	a 95	92	96½
National Electric Pwr-A	a 24½	19½	26½
Nat. Lt., Ht. & Pwr., com.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	100	....	....
National Pwr. & Lt., com.—no par.	22½	16½	38½
National Pub. Serv., 7% pf.	92	....	....
National Pub. Serv., pte. pf.	110	....	....
National Pub. Serv., A com.—no par.	19½	15½	24
National Pub. Serv., B com.—no par.	15½	10	17½
Nebraska Pwr., 7% pf.	l105½	103	107½
Nevada-Calif., Elec., com.	m 23½	18½	44½
New Brunswick Pwr., pf.	50	30	55
New England Pub. Serv., pr. ln. pf.	97	98	99½
New England Pub. Serv., pf.	89	95½	97
N. J. Pwr. & Lt., 7% pf.	106	107	108
New Orleans Pub. Serv., 7% pf.	101½	....	....
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	87	....	....
N. Y. Central Elec., 7% pf.	k 98	98	100
Newport News & Hampton Ry., Gas & Elec., com.	109	98	112
Newport News & Hampton Ry., Gas & Elec., pf.	109	98	114
Niagara Falls Pwr., 7% pf.—25	k 28	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf.	109	110	111½
No. Amer., 6% pf.—50	51	49	51½
No. Amer., com.—10	55½	42	67
No. Amer. Edison pf.—no par	95½	91½	96½
No. Amer. Lt. & Pwr., pf.	101	88	104
No. American Utilities, pf., full pd.	m 94½	89	96
No. American Utilities, pf., 25% pd.	m 19	18	27
N.C. Pub. Serv., pf.—$7—no par.	93	....	....
Northeastern Pwr., com.	19½	17½	36½
No. Indiana Gas & Elec., pf. A	100	98	103
No. N. Y. Utilities, 7% pf.	104	....	....
No. Ohio Pwr., com.—no par	15½	11	26½
No. Ohio Trac. & Lt., 6% pf.	80	78	81
No. Ohio Trac. & Lt., 7% pf.	94	88	96
No. Ont. Lt. & Pwr., pf.	83	....	....
No. Ont. Lt. & Pwr., com.	73	45	75
No. States Pwr., 7% pf.	95	....	....
No. States Pwr. com.	105½	97	136½
No. Texas Elec., 6% pf.	48	....	....
No Texas Elec., com.	18	....	....
OHIO BRASS, com. B—no par	74	70	79
Ohio Brass, pf.	101	98	101
Ohio Gas & Elec., 7% pf.	94	92	95
Ohio Pwr., 6% pf.	95	95½	96
Ohio Pub. Serv., 6% pf.	l 94	90	96
Ohio Pub. Serv., 7% pf.	l 99	96	100
Ohio River Edison, pf.	101	....	....
Oklahoma Gas & Elec., pf.	95	....	....
PACIFIC GAS & ELEC., 6% pf.	100½	....	....
Pacific Gas & Elec. com.	k129	118	132½
Pacific Pwr. & Lt., 7% pf.	l102	98	102½
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt & Pwr., pf.—no par	c 72½	71	91
Penn-Ohio Edison, 7% pf.	96	....	....
Penn-Ohio Elec., 7% pf.	95	97	98
Penn-Ohio Pwr. & Lt., 7% pf.	96	97	98
Penn-Ohio Pwr., & Lt., 8% pf.	106	100	109
Penn Pwr. & Lt.—$7—no par.	l107	103	108½
Penn Pub. Serv., 7% pf.	101	96	103
Penn Pub. Serv., 6% pf.	85	85	90
Penn Wtr. & Pwr., com.	c 150	141	171
Phila. Co., 6% pf.—50	k 50	47½	51½
Phila. Co., com.—50	k 70	59½	76½
Phila. Elec., com.—25	c 51½	41½	67½
Pittsburgh Utilities, pf.—10	m 17	14½	20½
Portland Elec. Pwr., 7% pf.	100	....	....
Portland Elec. Pwr., 6% pf.	84	....	....
Portland Elec. Pwr., 6% 2nd pf.	71½	....	....
Portland Elec. Pwr., com.	31	....	....
Potomac Elec. Pwr., pf.	j108	....	....
Pwr. Corp. of N.Y., com.—no par.	m 79	77½	90½
Pwr. Secs., pf.—no par.	k 10	10	29
Pwr. Sec., com.—no par.	k 4	4	13
Pub. Serv. of N. J., 7% pf.	k107	103½	109½
Pub. Serv. of N. J., 8% pf.	120	115	122
Pub. Serv. of N. J., com.—no par.	92½	72	93½
Pub. Serv. of No. Ill., 6% pf.	a103	100½	106
Public Serv. of No. Ill., 7% pf.	a113½	112	116½
Pub. Serv. of No. Ill., com.—no par	a134	128½	140
Pub. Serv. of No. Ill., com.	a134	129½	140
Pub. Serv. of Okla., 7% pf.	95	92	97
Pub. Serv. Elec. & Gas, 6% pf.	k102	97	104
Public Service Elec. Pwr., pf.	112	106	114
Puget Sound Pwr. & Lt., 7% pf.	102	....	....
Puget Sound Pwr. & Lt., 6% pf.	82	....	....
Puget Sound Pwr., & Lt., com.	28	28	66½
RADIO CORP. OF AM., pf.—50	k 48½	44½	48½
Radio Corp. of Amer., com.—no par.	43½	32	48½
Republic Ry. & Lt., pf.	106	....	....
Republic Ry. & Lt., com.	82	....	....
Rochester Gas & Elec., 5% pf.	95	80	98
Rochester Gas & Elec., 6% pf.	101	....	....
Rochester Gas & Elec., 7% pf.	104	105	107
SAN JOAQUIN LT. & PWR., 7% pf.	97	97½	98½
Safety Cable, com.	50½	42½	54½
St. Joseph Ry., Lt., Ht. & Pwr., pf.	67	60	70
Servel Corp.	19½	18	22½
Sierra Pacific Elec., com.	27	....	....
Sioux City Gas & Elec., 7% pf.	98	....	....
S. E. Pwr. & Lt., pf.—$7—no par.	l 99	....	....
Southeastern Pwr. & Lt., pfc. pf.	l 65½	....	....
S. E. Pwr. & Lt., com.—no par.	29½	20	46½
So. Calif. Edison, 8% pf.—25	32	32½	33½
So. Calif. Edison, 7% pf.—25	k 27½	27½	28½
So. Calif. Edison, 6% pf.—25	k 24½	24½	25½
So. Calif. Edison, com.	31½	30½	33
Southern Cities Utilities, 7% pf.	85	....	....
Southern Cities Utilities, com.	36	....	....
Southwestern Lt. & Pwr., A	60	....	....
Southwestern Lt. & Pwr., B	60	....	....
Southwestern Lt. & Pwr., $6 pf.	82	....	....
Southwestern Pwr. & Lt., 7% pf.	k104	100	105
Springfield (Mo.) Ry & Lt., 7% pf.	99	95	100
Standard Gas & Elec., 8% pf.	57	53½	57½
Standard Gas & Elec., 7% pf.	103	....	....
Standard Gas & Elec., com.—no par.	55	51	69
Standard Pwr. & Lt., 7% pf.	k 94	90	97
Staten Island Edison, pf.—$6—no par	96	....	....
Superheater, com.—no par.	159	....	....
Syracuse Lighting, 7% pf.	102	105	107
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, com.	335	260	345
TAMPA ELEC., com.,	k 50	48	67
Tenn. Elec. Pwr., 6% pf.	89	....	....
Tenn. Elec. Pwr., 7% pf.	101½	....	....
Terre Haute, Ind. & East Trac., pf.	20	20	37
Terre Haute, Ind. & East. Trac., com	1	1	7
Tex. Pwr. & Lt., 7% pf.	l106½	102	106½
Tide Water Pwr., 8% pf.	101	....	....
Timken Roller Bearing, com—no par	61½	44½	62½
Toledo Edison, 8% pf.	l113	111	113
Toledo Edison, 7% pf.	l102½	101	103
Toledo Edison, com.	l102½	101	103
Tri-City Ry. & Lt., 6% pf.	88	87½	89
UNITED GAS & ELEC., 6% pf.	95½	....	....
United Gas & Elec., com.—no par.	m 57	56	66
United Gas & Elec. (N.J.), 5% pf.	71	....	....
United Gas Impr.—50	c112	84½	144½
United Lt. & Pwr., pf.—$4—no par.	50	44	51
United L. & P. pf.—$6.50—no par.	86	81	91
United Lt. & Pwr., com., A—no par	a 16½	13½	26
United Lt. & Pwr., com., B—no par	k 15	13	29
Utah Pwr. & Lt., 7% pf.	l102½	99	103½
Utica Gas & Elec., 7% pf.	104½	....	....
Utica Gas & Elec., com.	200	....	....
Utilities Pwr., & Lt., 7% pf.	92	....	....
Utilities Pwr. & Lt., com A	29½	28½	37
Utilities Pwr. & Lt., com. B—no par.	k 13½	13½	18
VERMONT HYDRO - ELEC., 7% pf.	95	96	97
Virginia Elec. & Pwr., 7% pf.	104	101	105
Virginia Pwr., 7% pf.	108	102	104
Virginian Pwr., com.	70	65	75
WAGNER ELEC., pf.	b 68	61½	85
Wagner Elec., com.—no par.	b 18½	13½	34½
Washington Ry. & Elec., com.	j195	....	....
Washington Ry. & Elec., pf.	j 90½	....	....
Washington Wtr. Pwr., com.	133	130	136
West Mo. Pwr., 7% pf.	93	....	....
West Penn., 7% pf., temp. ctfs.	m100	95½	101
West Penn, com.	m125	118	130
West Penn Elec., pf.	k100	95½	100½
West Penn Elec., Class A,	k 95	88½	97
West Penn Pwr., pf.	k111	108	112
West Va. Lt., Ht. & Pwr., 7% pf.	94½	95	98
West Va. Utilities, 7% pf.—50	45½	43	48
Western Pwr., 7% pf.	94	....	....
Western States Gas & Elec., 7% pf.	92	....	....
Western States Cas & Elec., com.	16	....	....
Westinghouse El. & Mfg., com—50	69½	65	79½
Weston Elec. Instrument, Class A..	32	27½	32½
Weston Elec. Instrument, com.	19	13½	19½
Wheeling Elec., pf.	94	91	97
Wis. Pwr., Lt. & Ht., 7% pf	k 90	85	90
Worthington Pump, pf. A	k 66	66	80
Worthington Pump, pf. B	k 45	53	65
Worthington Pump, com.	28½	20½	44½
YADKIN RIVER PWR., 7% pf.	l106½	102	107½
Yale & Towne, com.—25	68½	60½	69

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Franacisco; *i*Pittsburgh; *j*Washington. kBid, low, high, Saturday, Aug. 14. *l*Bid, low, high, Wednesday, Aug. 18. *m*Latest quotations available.

American Gas & Electric Company Issues Report

The American Gas & Electric Company has issued a combined statement of income for the twelve months ended May 31, 1926, and a balance sheet as of the same date. The combined statement of income shows a balance after all charges, including depreciation, of $8,463,612 applicable to the 1,286,941 no-par shares of common stock of the company outstanding at that date. This is equal to $6.57 per share. The balance sheet of the company as of May 31 shows total current assets of $31,671,220 and current liabilities of $2,055,730, an excess of current assets of $29,615,490. For the twelve months ended May 31 total gross earnings of subsidiary companies were $68,512,741. The company began business Jan. 1, 1907, and the gross earnings of its subsidiary companies at that time totaled only $1,727,266.

Los Angeles Company Plans Refunding.—To avail itself of the present lower interest rates, the Los Angeles Gas & Electric Corporation within the next few months will issue a block of 5 per cent securities and redeem $6,895,500 of 7 per cent and 5½ per cent general and refunding mortgage bonds.

National Public Service to Exchange Stock.—Holders of the 7 per cent participating preferred stock of the National Public Service Corporation have been offered the right to exchange their holdings for 7 per cent, series A, preferred stock and the class A common stock on the basis of one share of the series A preferred and one share of the class A common for each share of 7 per cent participating preferred surrendered. There is outstanding participating stock to the amount of $4,219,300 par value.

Southern California Edison to Issue Stock.—The California Railroad Commission has authorized the Southern California Edison Company to issue 400,000 shares of its 6 per cent preferred stock, series B, on or before June 30, 1927, and to use the proceeds to finance uncapitalized expenditures as of April 30, 1926, and to reimburse its treasury on account of retiring bonds in the amount of $974,166.

New Capital Issues

During the week ended Aug. 19 the Northern Electric Company (Wisconsin) made an offering of three-year 6 per cent first mortgage gold bonds, a piece of financing involving a total of $3,000,000. These bonds were priced at 99 and interest, yielding 6.38 per cent. The company, controlled through stock ownership by the Northern Paper Mills of Green Bay, Wis., owns approximately 70 miles of recently completed 122,000-volt steel-tower transmission line, running north from the mills of the Northern Paper Mills at Green

Bay to connect upon completion of a 9-mile addition to the line with its two hydro-electric power plants being developed on the Menominee River. The proceeds from the sale of these bonds will be used toward the acquision of the company's present properties, and funds not immediately so applied will be deposited with the trustee to be expended only in connection with the completion of the dams, generating stations, transmission lines and necessary auxiliary apparatus, and the acquisition of additional lands and rights.

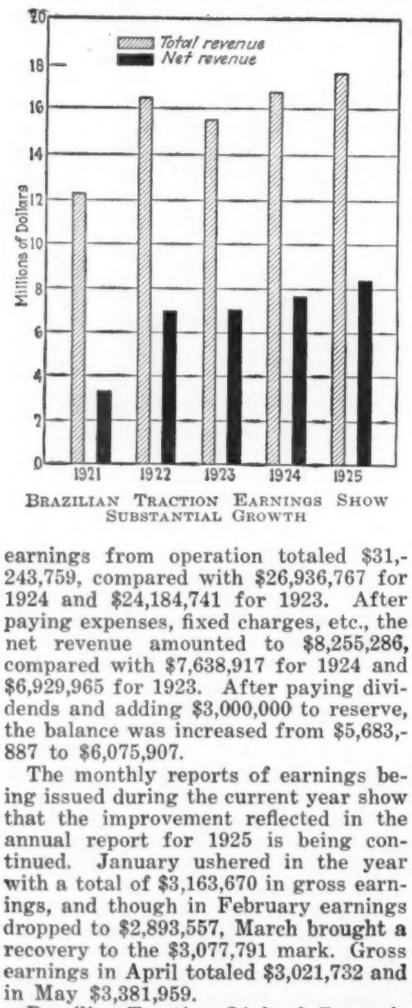
A new issue of $700,000 par value of 6 per cent preferred stock of the Indiana Service Corporation, one of the operating subsidiaries of the Midland Utilities Company, was offered at $92.50 per share to yield about 6.50 per cent. The last preferred stock of the Indiana Service Corporation was a 7 per cent issue.

The Derby Gas & Electric Corporation issued 15,000 shares of seven-dollar dividend preferred stock, the price being $96 per share and accrued dividend to yield about 7.29 per cent.

Brazilian Traction Shows Substantial Gains

Both Gross and Net Earnings of Canadian-Controlled Utility Increase During 1925—Improvement Continuing in Present Year

THE annual report of the Brazilian Traction, Light & Power Company, Ltd., for the year 1925 showed substantial increases in both gross and net earnings and in the amount available for distribution on the common shares. After all charges there was shown $7.18 per share on common, compared with $6.60 in the previous year and $5.94 in 1923. The increase in gross was almost 16 per cent and in net before depreciation something over 5 per cent. Gross



BRAZILIAN TRACTION EARNINGS SHOW SUBSTANTIAL GROWTH

earnings from operation totaled $31,243,759, compared with $26,936,767 for 1924 and $24,184,741 for 1923. After paying expenses, fixed charges, etc., the net revenue amounted to $8,255,286, compared with $7,638,917 for 1924 and $6,929,965 for 1923. After paying dividends and adding $3,000,000 to reserve, the balance was increased from $5,683,887 to $6,075,907.

The monthly reports of earnings being issued during the current year show that the improvement reflected in the annual report for 1925 is being continued. January ushered in the year with a total of $3,163,670 in gross earnings, and though in February earnings dropped to $2,893,557, March brought a recovery to the $3,077,791 mark. Gross earnings in April totaled $3,021,732 and in May $3,381,959.

Brazilian Traction, Light & Power is now approaching a three-hundred-million-dollar undertaking. Total assets as shown in the balance sheet at the end of 1925 amounted to $275,391,263, an increase of nearly $10,000,000.

As a result of the measures taken to increase the power supply in São Paulo made necessary by the severe drought in 1924-1925, two new installations have been completed, a 25,000-hp. unit at Sorocaba and a 32,000-hp. development at Rasgao. Before the end of this year the first two units of 80,000 hp. in connection with the Serra development will be ready for service. These installations, together with the earlier installations at Parnahyba and Sorocaba, provide a total installed hydraulic capacity of approximately 220,000 hp.

Owing to satisfactory earnings statements and to the favorable exchange situation the Brazilian Traction stock has been making advances that represent some remarkable profits to the shareholders since the upward movement started at 50 last year.

Company Reports

The following statements of earnings have been issued by electric light and power companies for the month of June:

Name of Company	Gross Earnings for June 1926	1925
Adirondack Power & Light*	$689,831	$641,716
Northern Ohio Power	973,993	927,811
Ottawa & Hull Power*	29,442	27,663
Southern Canada Power	107,771	96,110
Winnipeg Electric	431,328	406,612

* July.

Customer Sales Reach $21,710,000 in June

Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to their customers and employees, it is estimated that during June a total of 334,000 shares was sold in this manner. The value of the stock sold is estimated at $21,710,000. A total of 36,700 customers took part in the sales during June.

Blackstone Valley Gas & Electric Increases Capital.—The Blackstone Valley Gas & Electric Company has increased its capital stock $1,299,350, making the total stock now outstanding $9,146,200. The increase was authorized at a meeting of the stockholders on April 21. The increase will consist of 25,987 shares of common stock, bringing the total common outstanding to 155,924 shares of $50 par value. It was provided that the additional stock would be offered to shareholders of the company on the basis of one share for each five held.

General Gas & Electric Listing.—The New York Stock Exchange has authorized the listing of permanent certificates for 204,066 shares of common stocks, class B, of the General Gas & Electric Corporation of Delaware, without par value. Of the 204,066 shares applied for, 204,056 shares were issued in exchange for preferred stock of the General Gas & Electric Corporation of Maine and common stock of the General Gas & Electric Company of Maine under plan and agreement dated July 1, 1925, and ten shares representing incorporator's shares were issued for cash at $25 per share.

Columbus Electric & Power to Increase Stock. — Stockholders of the Columbus (Ga.) Electric & Power Company will vote Sept. 16, (1) on increasing the authorized capital stock from $9,750,000 to $11,750,000, the two-million-dollar increase to consist of preferred stock, series C, $500,000 of which is to be issued shortly and the balance from time to time according to the company's needs; (2) on authorizing and providing for changing the 52,500 shares $100 par value common stock now outstanding into 262,500 shares without par value and for the exchange of five new shares for every share held.

Associated Makes Exchange Offer.—Letters have been sent to stockholders of the Penn Public Service Corporation 6 per cent preferred stock by the Associated Gas & Electric Company offering them in exchange for each share of their stock one share of Associated Gas & Electric Company $6.50 dividend series preferred, or one share of that company's $6 dividend series preferred with one-third share of common stock. Both of these preferred stocks are equal in rank to other preferred stocks of the Associated Gas & Electric.

Illinois Utility Reclassifies Preferred Stock. — Stockholders of the Illinois Power & Light Corporation on July 14 approved a change in the dividend rate upon the unissued 70,000 shares of the preferred stock from 7 per cent to 6 per cent per annum. The new issue of 6 per cent preferred stock will have the same rights, privileges, preferences and restrictions as the old 7 per cent cumulative preferred shares, the only difference being in the rate of yield.

American Bosch Magneto Income.—For the quarter ended June 30, 1926, the American Bosch Magneto Corporation reports net income of $104,844 after depreciation, etc., but before federal taxes, equivalent to 50 cents a share on the 207,399 shares of no-par capital stock outstanding. This compares with $165,263, or $1.19 a share, on the 138,266 shares of no-par capital stock outstanding in the corresponding quarter a year ago. For the six months ended June 30 net income amounted to $243,752, or $1.17 a share, compared with $241,895, or $1.75 a share, in the similar period of 1925.

Manufacturing and Markets

Appliance Advertising Campaigns

Manufacturers Indorse Success of Spring Campaigns and Refer to Greatly Increased Sales—New Co-operative Plans Give Great Promise

CONSIDERABLE success attended the concurrent advertising campaigns operated last spring by the Commercial National Section of the National Electric Light Association, according to the report of E. W. Lloyd, chairman of that section during the initial campaign period, and a number of requests have been made for additional campaigns as contemplated. New co-operative plans have been outlined by the Commercial National Section in order that the manufacturers may have plenty of time to prepare their advertising schedules for the period covered by these campaigns.

INITIAL CAMPAIGNS SUCCESSFUL

The Commercial Section in its report says it feels that these campaigns should be continued and developed and is confident that in the near future more comprehensive plans covering a wider diversity of electricity-consuming devices can be handled in the same manner. The first two campaigns conducted, one in March covering toasters and the other in April covering percolators, were staged to prove that this was a practical way of increasing merchandise sales, and it conclusively demonstrated the feasibility of carrying on these campaigns through the co-operation of the manufacturers and any other electrical agency available for this purpose. From the reports of all the manufacturers the Commercial Section says it is quite evident that many more toasters and percolators were sold during the periods of the campaigns than in any corresponding period, and the manufacturers are enthusiastic over the plan.

At the Atlantic City convention it was agreed that campaigns be conducted from Sept. 15 to Oct. 15 on heaters, from Oct. 15 to Dec. 25 on the general gift line, during February, 1927, on waffle irons, during March, 1927, on toasters, and during April, 1927, on percolators. These periods were selected as best suited to the majority of locations in the United States, as they seemed ideal for the sale of each particular device mentioned in the foregoing campaign schedule, and the selection was made by men who have studied this situation for many years.

Based on past experience in the two campaigns conducted last spring, the Commercial Section in its report states that it should be evident that concentrated advertising will create a great deal of interest in the mind of the public on these various devices, and it is expected that many millions of advertising messages will appear in the national magazines during the periods suggested. This form of concurrent advertising is new to the electrical industry, but its success has already been demonstrated, and the Commercial Section states that if local companies tie in with the efforts of the national manufacturers, there is no question that the plan will be continued and become more effective each year.

Local advertising is suggested in conjunction with the concurrent national advertising of the manufacturers, but the Commercial Section feels, while recommending its use as important, that its non-use should be no reason for not campaigning on the devices during the particular periods selected. The Commercial Section has prepared blank typical newspaper advertisements for these devices and has reproduced them in its report as suggestions. Many of the manufacturers have also prepared suggestions for newspaper advertisements which incorporate their own appliances, and these can be used by the local central-station companies. In a number of cases it is believed that the central-station companies may find that such advertisements fit their needs better than do the suggestions of the committee.

The Commercial Section also suggests a direct-mail campaign and for direct-mail material refers the company to its jobbers or the salesmen of the manufacturer whose electrical devices it is selling. The manufacturer is referred to as being thoroughly familiar with these campaigns and as willing to assist in obtaining results. It is also urged that store windows be used for the exclusive display of the electrical device being pushed at the time. The use of canvassers for selling the various articles is a method which must be considered by each central-station company in accordance with its policy.

The success of the campaigns on these various devices, which are essentially campaigns for concurrent advertising, depends upon the concentrated effort of all branches of the industry, so that the greater number of elements that can be brought into the campaigns the greater the success achieved. The manufacturer must thus co-operate with his jobbers and see that they are prepared to back the campaigns with advertising, and the manufacturer must be prepared to furnish his dealers with the articles. The hardware dealer selling electrical goods, the department store, and in fact every retail outlet for electrical devices, must be an active participant if the most successful results are to be obtained.

Business at High Level

Colonel Ayres Says There Are No Indications of Drastic Changes During the Remainder of This Year

AN UNUSUALLY high level is being maintained by business for this season of the year, and indications are that there will be no drastic changes during the remainder of this year, ac-

Delinquent Electrical Accounts

(Data Supplied by National Electrical Credit Association)

NUMBER OF ACCOUNTS REPORTED

Division	July 1925	July 1926	Per Cent Increase or Decrease	Six Months 1925	Six Months 1926	Per Cent Increase or Decrease
New York	356	339	— 4.7	2,787	2,729	— 1.4
Middle and Southern Atlantic States	216	202	—6.48	1,839	1,385	—16.7
New England	87	89	+ 2.29	610	908	+48.8
Pacific Coast	18	16	—11	133	183	+37.5
Central	183	742	—8.7	6,344	6,380	+ 0.6
Total	1,490	1,388	—6.8	11,493	11,565	+ 0.63

TOTAL AMOUNTS REPORTED

Division	July 1925	July 1926	Per Cent Increase or Decrease	Six Months 1925	Six Months 1926	Per Cent Increase or Decrease
New York	$42,504	$45,045	+ 6.0	$408,515	$401,755	— 1.6
Middle and Southern Atlantic States	30,594	24,361	—20.3	231,743	148,483	—35.9
New England	15,310	8,750	—42.8	75,761	60,562	—20.0
Pacific Coast	5,063	2,113	—58.2	21,809	31,444	—44.1
Central	101,874	87,366	—14.2	766,761	693,924	— 9.5
Total	$195,345	$167,635	—14.1	$1,504,589	$1,336,188	—11.1

AVERAGE AMOUNTS

Division	July 1925	July 1926	Six Months 1925	Six Months 1926
New York	$120	$133	$147	$147
Middle and Southern Atlantic States	141	120	141	107
New England	175	98	124	66
Pacific Coast	281	132	163	171
Central	125	118	121	109

cording to Colonel Leonard P. Ayres, vice-president of the Cleveland Trust Company. "No midsummer dullness has developed in general business this year," said Colonel Ayres, "and this fact is noteworthy, because in every other year since the World War, excepting 1922, there has been a genuine slowing down during the summer months. At the present time the fundamentals of business are sound and the key industries are active."

New records are being made in car loadings, building construction, steel output, automobile production, bank clearings and electric power consumption, and Colonel Ayres pointed out that it is probable that the country-wide volume of industrial and transportation profits would be greater in 1926 than ever before.

"These conditions are characteristic at the top of a period of business expansion and prosperity," he said, "and because this is true, it is reasonable to anticipate some future slowing down rather than a long-continued advance. Nevertheless, no serious or sudden recession is likely, because the conditions that have accompanied important business recessions in the past are not developing. In the past quarter century in this country periods of business prosperity have terminated, and given way to decline and depression, with advancing prices, commodity speculation, competition for labor, car shortages on the railroads, overproduction by industries and credit stringency. No such disquieting symptoms are now appearing."

Manufacturing Profits Less

Net Gains Due to Larger Sales Volume, Says Conference Board—Small Industry Loses Most

DESPITE the abounding prosperity on the part of many individual business concerns, indications are that less of the consumer's dollar is going into manufacturing profit now than has been the case at any time since the war, with the exception of the critical year 1921, according to a study of manufacturing corporation incomes made by the National Industrial Conference Board, New York. While in 1919 9.28 cents out of every dollar of the manufacturer's gross receipts represented net income, his net income amounted to only 6.35 cents per dollar of gross receipts in 1923, the latest year for which comprehensive income statistics are available. Out of that, moreover, he had to pay income and profit taxes. Although increased manufacturing efficiency may have increased the net income somewhat since that time, higher wages and a virtually stable price level combined have not left much leeway for the manufacturer to increase his margin of profit during the last two years, according to the board. The figures cited represent the total net income of all manufacturing corporations combined, taking into account those operating profitably as well as those operating at a loss.

While the number of manufacturing corporations reporting a net income was almost the same in 1919 as in 1923, showing an increase of only 3.6 per cent, their total gross income increased from $45,704,873,968 to $48,686,639,790, or 6.5 per cent. Prices, however, had declined considerably during the four years, so that the increase in volume of business done in 1923 over that of 1919 was considerably greater than indicated by the gross income figures. The gross income for both years, reduced in both instances to terms of dollars of 1913 purchasing power so as to take into account the price decline, shows an increase of 43 per cent from 1919 to 1923. Although this figure does not necessarily measure the exact increase in volume of business in all branches of manufacturing, it is significant when compared with the net income figures for the same years, which, likewise reduced to terms of 1913 dollars, show an increase of only 9.9 per cent from 1919 to 1923, definitely indicating the declining rate of profit at which these corporations were operating.

The average net income per manufacturing corporation, taking into account only those reporting a net gain, in 1919 was $100,560, but only $79,411 in 1923, a decline of 21 per cent. Compared in terms of 1913 dollars to eliminate price changes, this shows an increase of 6 per cent in the average net gain per corporation in that group. But this, the board concludes, patently is due to the increased amount of business done and does not represent an increased profitableness in the transaction of business.

Though the total number of all manufacturing corporations increased 25.5 per cent, from 67,852 in 1919 to 85,199 in 1923, those reporting a net income increased only 3.6 per cent, from 51,903 to 53,795, but those reporting no net income nearly doubled in number, increasing from 15,949 in 1919 to 31,404 in 1923. At the same time, the total gross income of these corporations reporting no net income increased only from $6,584,702,815 to $7,534,069,100, which, in the view of the board, would seem to indicate that the incidence of business loss tends to fall more and more on concerns operating on a small scale. For, even in terms of 1913 dollars to make the gross income figures for the two years comparable as indicating volume of business done, there was only a 53.6 per cent increase in the total gross receipts of these corporations operating unprofitably, although they increased 96.9 per cent in number. The total deficit of this group of manufacturing corporations increased from $366,745,733 in 1919 to $701,011,681 in 1923. Deflated into 1913 dollars, this shows an increase in total deficit of 156.7 per cent. The average deficit per corporation, in terms of 1913 dollars, according to the board's analysis, shows an increase of 30.4 per cent from 1919 to 1923.

The above analysis reveals that in 1923 manufacturing was done in greater volume, but at a considerably smaller margin of profit, and that the amount of manufacturing business done at a loss, or the volume of goods which were sold at prices which did not reimburse the manufacturers for their production, was half again as great in 1923 as in 1919, although both those years have generally been considered as good business years. This, in the view of the board, was owing partly to the fact that in 1919 business was being done at a rapidly rising level of prices, while in 1923 a fairly steady price level prevailed. While the latest available statistics for the above analysis are for the year 1923, much the same conditions prevailed in 1925 and the first half of 1926 as to the movement of prices, the board declares, making the significance of the 1923 figures applicable to present-day conditions.

Sales Statistics on Direct-Current Motors

Orders entered for direct-current motors during the month of June showed an increase over those entered in May or April but fell short of the peak established in March. Sales and billings for the first six months of 1926 are shown in the accompanying table and include control equipment sold with the motors.

ORDERS ENTERED AND SALES BILLED FOR DIRECT-CURRENT MOTORS

(1-hp. to 200-hp. inclusive, built in general-purpose motor frames, including control equipment sold with motors.)

(Issued by Electric Power Club.)

Month, 1926	Orders Entered	Billings
January	$815,976.75	$934,124.01
February	878,028.36	807,281.31
March	1,167,748.91	1,027,318.84
April	866,858.52	821,946.62
May	740,231.54	793,832.28
June	904,269.40	928,272.41
Year to date	$5,373,113.48	$5,312,775.47

Orders for Electrical Goods

New orders booked during the second quarter of 1926, as reported to the Department of Commerce by four of the principal manufacturers of electrical goods, were $177,706,963, as compared with $192,547,910 for the first quarter of 1926 and $164,461,010 for the second quarter of 1925. The accompanying totals of bookings for each quarter since the beginning of 1922 are presented not as a complete statement of the industry, but as probably sufficiently representative to indicate the trend:

ORDERS FOR ELECTRICAL GOODS

	1922	1923	1924	1925	1926
First quarter	$110,809,981	$172,146,267	$169,956,539	$176,654,049	$192,547,910
Second quarter	124,713,786	185,938,207	168,566,577	164,461,010	177,706,963
Third quarter	126,680,945	154,367,898	138,138,709	169,942,836	.....
Fourth quarter	145,370,263	161,955,949	174,296,318	173,025,408	.....
Total	$507,574,975	$674,408,321	$650,958,143	$684,083,303	.....

Refrigeration Is Gaining in Western Europe

A. H. Goss Sees Great Opportunity for Building Market Around Educated Taste for Ice Cream

RETURNING on Wednesday from Europe on the *Olympic*, A. H. Goss, president of the Electric Refrigeration Corporation of Detroit—the recent combination of the Kelvinator, Nizer and Grand Rapids Refrigeration companies—expressed great confidence in the outlook for a foreign market for American electrical refrigeration equipment. General business conditions in Europe show distinct improvement, he feels, despite the exchange situation in France and Italy. The introduction of improved processes of manufacturing is progressing steadily, and, in his opinion, electricity is going to be the biggest single factor in the rehabilitation of the western European countries. Local business and financial men are beginning to realize this. Mr. Goss cited the cork industry in Spain as a good example. It is rapidly ceasing to be a cottage industry because semi-automatic machinery has been invented and production is being concentrated in factories driven by individual electric motors, with an astonishing increase in production.

"It is natural for one to assume that Europe would offer little opportunity for the sale of electric refrigerators," said Mr. Goss, "because of the little use of ice in Great Britain and on the Continent and the custom of serving food and drinks—not cold, to say the least. But the recent history of ice cream in England is a good illustration of the possibilities there are for educating the taste of any public. Some time ago Selfridge introduced ice cream to the London public in his American department store as a novelty. Then the Lyons restaurants took it up, and in five years they alone have sold 30,000,000 gallons. They sold 1,250,000 gallons last year. They have also introduced American orangeade served cold and are now selling 3,600 gallons a day. In other words, the idea of refrigeration for the preservation of foods and the serving of cold drinks will eventually win enthusiasm and dependence in western Europe just as it does here. There is a strong movement on now in England for better care of foods as a health measure. This can be made possible only by the use of electric refrigeration. But a demand for electric refrigeration will compel an increase in the capacity of British power stations. I believe that the whole idea can be made to appeal greatly to British financiers as offering an opportunity to serve a public need by capitalizing an educated taste. It will entail the upbuilding of an industry that will provide for the investment of English capital at home."

Mr. Goss sees no danger of the present temper of France toward Americans embarrassing our export business. This feeling so blazoned in the newspapers is not shared by the business man, he says. There is some tendency both in Italy and in England to discriminate against American goods, but it will not affect the sale of products that can be offered on an even basis of quality and price. Mr. Goss estimates that there are probably one thousand domestic electric refrigerators now in use in western Europe. His company has been in the market one year, establishing its distribution, and he looks for a rapid development of business, for the idea is beginning to attract the popular interest in that territory.

Business Conditions

SALES continue to hold up remarkably well and electrical men foresee no indications of a decrease. Contrary to usual conditions, there has been no summer slump. Reports of business closed in July continue to show record total sales. A transformer manufacturer states that his July business was the highest on record for that month and did not include any spectacular orders. An order was placed for a 100,000-kw. turbo-generator unit for the Pacific Coast, and transformer business continues active, with a dullness noted in some sections. An order for $80,000 worth of transformers was placed in the northern Arkansas territory.

Wire sales are active and a number of carload orders are reported. Electric refrigeration, pump and machine-tool manufacturers are active buyers of motors and control equipment, and sales of small motors are generally in an encouraging volume. Activity continues in the lead belt of southeast Missouri and many orders are being received from that territory.

In the New England district central-station supplies are in strong demand and many good-sized orders for poles, wire and line hardware were placed. Insulators are in active demand, and negotiations are under way for a purchase aggregating 75,000 units. Small-motor sales are falling off, but an encouraging volume is being maintained. The market is spotty in the New York district, with one or two holding companies actively in the market for transformer equipment. One manufacturer reports a larger volume of orders for 3-hp. and 5-hp. motors than for any similar period in several years. In the Southeast business is seasonably quiet, but the volume is satisfactory. Small-motor sales in that district, particularly for installation in cotton gins, are reported good. Sales in the St. Louis district continue at a high level. In the northern Arkansas territory an order was placed for about $80,000 worth of transformers. Steady business continues in the Middle West and agricultural conditions are improving. On the Pacific Coast the general tone is more optimistic, and several orders were placed by industrial plants. Pump manufacturers have been buying many motors of from 10 hp. to 40 hp.

Metal Market Quiet—Prices Well Maintained

Prices have been well maintained in the non-ferrous metal market, but business has been quiet. Copper and zinc are slightly higher in price, with copper sales in considerably greater volume than last week. The prices of lead, tin and silver, on the other hand, are slightly less than a week ago. The large copper producers have continued all week, except for two sales of moderate tonnages, to quote Eastern consumers at 14⅛ cents and Middle Western at 14⅝ cents. Other sellers, however, shaded these prices materially, especially last week Thursday and Friday, when an excellent tonnage of copper was sold at 14⅜ cents, delivered in the Connecticut Valley. In fact, some was sold as low as 14.35 cents, though this was offset by a little Middle Western business at higher levels. The large producers sold only an occasional carload. On Monday, with the improvement reported from London, and having sold a satisfactory quantity, sellers were no longer willing to quote 14⅜ cents. On Wednesday various prices have been paid, from 14⅜ cents delivered in the East to 14⅝ cents for a large tonnage in the Middle West. Consumption continues excellent and apparently fully equal to production, but sellers do not expect a great deal of business until after Labor Day, as buying last month was heavy. The volume of sales this week has been almost twice that of last week, but still rather below the average.

NEW YORK METAL MARKET PRICES

	Aug. 11, 1926 Cents per Pound	Aug. 18, 1926 Cents per Pound
Copper, electrolytic	14.425	14.525
Lead, Am. S. & R. price	8.90	8.90
Antimony	16½	16½
Nickel, ingot	35	35
Zinc spots	7.70	7.75
Tin, Straits	65.375	64.75
Aluminum, 99 per cent.	27½	27½

Base copper price Aug. 18, 1926, 16½ cents.

The volume of new business in the lead markets has been of only modest proportions, with more activity in the West than in the East. The extremely active business of July and the first week of August have naturally been followed by a period of quietness, but deliveries under contract continue large. All of the producers are well sold for the month of August, and as much lead no doubt remains to be bought for September, the market appears to be well balanced. The American Smelting & Refining Company has maintained its contract price at 8.90 cents, New York. At the same time some small shipments for early delivery have been sold at 9 cents. Reports that brokers had offered 100 tons for August at 8¾ cents, New York, are not receiving much credence. Buying of zinc on the part of galvanizers has been in fairly good volume, practically all sellers having their share of the business as contrasted with many recent weeks when one or two companies took the bulk of

the orders. Prices have advanced gradually to 7.40 cents with most of the requests for September delivery. A sharp break in the London tin market last week Thursday was reflected in a reaction in the domestic market, and consumers bought fair quantities on Thursday and Friday. Prices stiffened on Monday and business was dull with prices largely nominal.

Market Spotty in New York District—Industrials Buying

Central-station buying in the New York district is spotty, and a decrease is also noticeable in the number of inquiries received. Poles, cross-arms, hardware, insulators and circuit breakers have been in particularly weak demand in this vicinity during the past week. Transformers are spotty, some sales being reported to holding companies for installation on Southern properties, and one or two holding companies are active in the market. There is a fair demand for switching equipment, although this, too, is not so heavy as last month.

The industrial demand is good for equipments of the smaller sizes, although there is comparatively little interest being shown in the larger sizes. However, one manufacturer says that in the past few weeks he has received a larger volume of orders than in any equal period of time for several years. These orders are mostly for 3-hp. and 5-hp. equipments. Electric refrigerator, pump and machine-tool manufacturers appear to lead in buying motors and control equipment. Jobbers report a fair volume of sales of conduit, fittings, etc., with unstable prices on most of the standard articles.

Central-Station Supplies Active in New England District

Demands for central-station supplies were strong throughout the New England district. A number of good-sized orders for poles, wire and line hardware were placed. Insulators are in active demand and negotiations are under way for deliveries in this district and south Atlantic states for large numbers, aggregating about 75,000. Wire shipments amounting to several cars weekly are reported by one prominent jobber, and cable and wiring devices are attracting increasing attention on account of the rapid progress in new construction, which, it should be noted, is setting a high level record in this district. The industrial equipment market is quiet at present. On the other hand, of striking interest is an order recently placed for a 100,000-kw. turbo-generator for the Long Beach plant of the Southern California Edison Company, and this unit will be duplicated in the future, according to plans recently announced. Small-motor sales have fallen off as compared with previous weeks' totals, but still maintain an encouraging volume in output. Mill projects involving the purchase of a large quantity of electrical equipment are under consideration throughout northern New England and are expected to mature this fall.

Negotiations in good volume continue to mark the electrical heating activities, street lighting is progressing and new projects continue to attract attention. In Boston a "white way" on Massachusetts Avenue is under consideration. Household appliance sales have fallen behind a little. Radio demands are advancing rapidly, with a strong demand for wire, tubing and batteries featuring this market. Telephone extensions amounting to over $3,000,000, involving new exchange development, as well as underground work, have been announced. In the opinion of a number of prominent manufacturers and jobbers, August business, so far, is both steadier and stronger in tone than that of July.

Steady Business Continues in the Middle West

Good business continues in the Middle West, and agricultural conditions are improving. That the farm implement industry has recovered from the depression of 1921 is becoming more and more evident. Mercantile reports show an increase in the volume of business and car loadings are at a high level. A good volume of business is being received from the utility companies, one of which reports continued purchases in excess of $70,000 per day. Weatherproof wire manufacturers are receiving inquiries for large quantities of wire and cable, and reports from paper-insulated manufacturers state that they are operating at capacity. Among the interesting orders placed this week was one for 6,000 5-amp. watt-hour meters, a quantity of current transformers and 1,500 direct-current watt-hour meters.

Business continues good from the jobbers' viewpoint. Hotel and restaurant equipment is in demand, and there is a good sale of domestic ranges. Appliances of all kinds are moving steadily with electric flatirons somewhat in the lead. An interesting order of "Tungar" radio chargers valued at over $20,000 was placed this week. Portable lamps are moving readily and industrial lighting sales continue quite heavy.

Sales in the St. Louis District Continue at High Level

Manufacturers and jobbers in the St. Louis district are unanimous in their expression of optimism as to general business for the coming season. In fact, all agree there has been no summer depression and that it is too late now for a slump to come. Already some lines are showing unusual activity for August. Radio demand is starting in a small way, and, coming before the first of September, this indicates a rush as atmospheric conditions improve. There is a marked increase in orders for all kinds of building supplies and equipment. While there appears to be no very large business in sight, the volume is regular and holding up well.

In the northern Arkansas territory an order has been placed by one of the large utility companies for four 1,500-kw. and three 2,500-kw. transformers, at a total cost of about $80,000. The activity in the lead belt of southeast Missouri continues. One order for motor-driven centrifugal pumps aggregating over $20,000 has been placed during the past week. While the price of lead remains at its present high level, the mining companies are removing all antiquated apparatus and installing equipment for applying new and more efficient methods of extracting the metal from the ore.

Business in Southeast Seasonably Quiet—Volume Satisfactory

Business throughout the Southeast, while seasonably quiet, continues generally good. Several outstanding orders were placed this week, and the gross volume of business was satisfactory. Shipments have started on an order for $225,000 worth of poles which was recently placed. Purchases of wiring devices by contractors continue in fair volume, and summer campaigns by power companies have served to hold up the volume of appliance sales to a satisfactory level for this period of the year.

Sales of general purpose motors, particularly for installation in cotton gins, are reported good and ahead of those for this time last year. Several very satisfactory large industrial jobs are in the immediate offing and will possibly be closed during the coming week. Two orders for high-tension transformers and oil-switching equipment, totaling $120,000, were received last week. Purchases of substation equipment continue good, though no large single orders are to be noted at this time. High-tension transformers up to 300 kw. capacity are also in considerable demand and the movement of the distribution type is reported excellent.

Tone Optimistic on Pacific Coast —Many Industrial Orders

The general tone is more optimistic on the Pacific Coast, maintenance purchases are larger and unemployment has decreased. The average large contractor in the Bay region is operating at least a two-thirds crew and prices are firmer. Power-company purchasing has been marked by several large inquiries such as one for 200,000 ft. of galvanized wire strand and 3,500 lb. of weatherproof tape, but orders are mainly for scattering small items. An order for 3,000 watt-hour meters was also reported. Miscellaneous business from industrial plants is proportionately the best kind of business reported, and it includes such items as 1,000 metal reflectors for 200-watt lamps, totaling about $4,000, a power panel worth $1,000 for a meat-packing plant, 25 miles of No. 12 bare copper wire, three transformers, each 1,000 kva., for an east Bay plant, and six two-speed motors for an oil company. The oil companies have all been placing fairly large orders for miscellaneous wiring supplies, and pump manufacturers have been buying many motors from 10 hp. to 40 hp. for centrifugal pumps. This business, normally a spring activity, now seems definitely established on an all-year-round basis. Litigation between two competing companies has indefinitely postponed orders pending for ten ferryboats for San Francisco Bay service with an estimated total

electrical installation value of $1,000,000.

Buying of motors and generating equipment for lumber mills and pulp-manufacturing plants in the Puget Sound District, forecast several weeks ago, has started slowly, and several orders of considerable proportions were placed. Orders signed include 20 motors, from 50 hp. down, approximating 500 hp., for a Bellingham mill, and also cover starting equipment and control, reduction gearing, etc. A 5,000-kw. generator for a pulp plant and lumber mill at Shelton and $20,000 worth of electrical equipment and motors for a lumber mill at Edmonds were also purchased. The city of Tacoma has awarded a contract for $60,000 worth of electric cable for underground installation in the downtown district, and the city of Seattle will award a contract the latter part of this month for 110,000 lb. of weatherproof copper wire for local extension work. Seattle concerns report a fair demand for poles, pole-line hardware, etc., to power companies for maintenance work and minor extensions with indications of better business during fall months. The movement of receptacles, switches, and other wiring devices is sluggish with an increase in volume anticipated during the coming month. Indications of rather exceptional building activity in Seattle and Puget Sound centers during the remainder of the year are becoming more pronounced.

Activities of the Trade

July Sales of Copeland Products Largest on Record

Sales of Copeland Products, Inc., during the month of July were the largest from the standpoint of production and shipments which the company has ever enjoyed, according to George W. Mason, vice-president and general manager. "Orders on the books at the present time are so far in excess of the capacity of the plant as originally laid out that it has been necessary to revamp the entire production lines and work two shifts," said Mr. Mason, "and August shipments will be practically double those of July." Mr. Mason says that the reception which the public and Copeland distributing organizations have accorded the Model 215, which the company has recently placed on the market, has been more than gratifying to the officials and executives of the Copeland organization.

Mr. Mason estimates that Copeland business for 1927 will easily quadruple the 1926 business, and plans are already being laid for increasing production facilities. Additional modern equipment is being installed and the manufacture and assembling is being put on a progressive assembly basis, which has been common practice in the automobile business for many years. It is quite probable that substantial additions to the present plant will be made early next year, although no definite announcements are made as yet. W. D. McElhinny, vice-president in charge of sales, at present touring the Eastern territory visiting distributors and dealer organizations and holding group sales meetings, reports increasing interest and development at every point.

German Electrical Plants May Form Merger

Rumors of a merger of German electrical manufacturing plants has resulted in a brisk demand for the shares of the companies involved, and no positive denial was forthcoming that the merger was not under consideration. It was also rumored that Siemens-Schuckertwerke, Germany's largest electrical manufacturer, was planning to conclude a loan of $30,000,000 with a group of American and German banks. Indirect American financial participation in the proposed merger is already viewed as likely.

No Change in Status or Management of Johns-Manville

Reports that the control of Johns-Manville, Inc., 292 Madison Avenue, New York, was about to pass to banking interests, which might in turn sell the stock to the public after making capital readjustments, have been set at rest by the announcement of H. E. Manville, now president, who has obtained control by purchase and stock support.

Some time ago negotiations were begun looking to the sale of an important stock interest to J. P. Morgan & Company, but the late T. F. Manville changed his mind and decided to retain his holdings. Other banking interests have also sought to obtain control of the company. The company manufactures asbestos and magnesia products, electrical insulating materials, fuses, fiber conduit, etc. The new president says that no change will be made in the management or status of the corporation.

The Electro-Kold Corporation, Spokane, Wash., has recently placed on the market three new all-steel or all-porcelain models of its "Electro-Kold" refrigerator.

The American Brown Boveri Electric Corporation, 165 Broadway, New York, announces the opening of a district sales office at 922 Witherspoon Building, Philadelphia, in charge of Louis T. Peck.

The Newark Electrical Supply Company, 152 Mulberry Street, Newark, N. J., announces the receipt of an appointment as New Jersey's first Westinghouse agent-jobber. The company will carry a complete stock of Westinghouse lamps, appliances and other products, as well as an unusually large stock of Westinghouse motors for immediate delivery.

The B. K. Sweeney Electrical Company, Denver, after 25 years of service as manufacturers' representative, has entered the jobbing field and has discontinued acting as agent for all manufacturers with the exception of the Ansonia Electrical Company, the Weston Electrical Instrument Company and the New York Insulated Wire Company.

New Equipment Available

Battery-Charging Equipment

As a result of modifications of design, the General Electric Company is now marketing a complete new line of battery-charging equipments in uniform frame sizes. These equipments consist of motor-generators and unit control sections, and they are particularly applicable to the multiple charging of batteries used in electric industrial trucks, electric road trucks and storage-battery locomotives. The motor-generators are designed to operate at speeds running from 1,800 r.p.m., for the sizes up to 35 kw., to 1,200 r.p.m. in the larger sizes. Stocks will be carried of outfits for such special voltages as 32, 45 and 55, together with the standard 115-volt type.

A complete new line of unit-control sections for these motor-generators has also been announced. These will be furnished either as part of the complete charging equipment or separately. An important feature of the design is compactness, making it possible to control a large number of circuits in a limited space. The general line consists of two-circuit sections designed for manual control of the charging rate and the terminating of the charge by means of a contact-making ampere-hour meter installed on the truck. An important feature of the construction is the ease with which a single section with its two resistors may be removed in a unit if necessary. This is accomplished by removing four cap screws at the corners of the panel and detaching the vertical busbars from the back of the resistor supports, when the entire section may be easily slid out. Any number of control sections can be combined with generator sections to make a complete panel. Various modified forms of sections are available and will be furnished for any set of circumstances, thus covering every condition of battery charging.

Crane-Type Electric Truck

A crane-type electric truck for cupola charging has been placed on the market by the Baker-Raulang Company, Cleveland. The machine operates in connection with a Chisholm & Moore 1-ton charging bucket and makes use of the Morgan patented bucket yoke. The truck itself is assembled principally with standard Baker parts, such as axles, controller, etc., and a 48-volt storage battery is used.

New Trade Literature

AUTOMATIC STATIONS.—The General Electric Company has issued bulletin GEA-90A, which lists the automatic station installations made up to Jan. 1, 1926. The bulletin covers a variety of equipment including alternating-current reclosing feeders, direct-current reclosing feeders for mining service, hydro-electric generators, etc.

KNIFE SWITCHES, DIRECT-CURRENT GENERATORS AND EXCITERS, AND CUT-OUTS FOR STREET - LIGHTING UNITS.—The General Electric Company has issued a series of bulletins Nos. GEA-367, GEA-368, GEA-432, GEA-433 and GEA-469, covering type QP-1 quick-break knife switches, type LP-1 knife switches with round studs, type CD direct-current generators and exciters, 2-kw. to 100-kw., type BD direct-current generators and exciters, ¾-kw. to 2¼-kw., and "Novalux" cut-outs for ornamental street-lighting units.

ELECTRIC REFRIGERATORS. — The Electro-Kold Corporation, Spokane, Wash., has issued a circular describing its three new all-steel or all-porcelain "Electro-Kold" electric refrigerators.

HIGH-TEMPERATURE CEMENT.—The General Refractories Company, 117 South Sixteenth Street, Philadelphia, has issued a folder describing its "Grefco" high-temperature cement.

SWITCHING EQUIPMENT.—"Switching Equipment for Alternating-Current Power Stations" is the title of a 112-page publication issued by the Westinghouse Electric & Manufacturing Company. This well-illustrated publication, No. 1541-C, deals with the general fundamentals that should be borne in mind when laying out a switchboard and describes in detail the various types of switching equipment. Safety inclosed switchboards are the subject of one section, and the direct-control switchboard for 2,500 volts or less, with oil circuit breakers and busbars supported from the back, is explained in another section.

TURBINE-DRIVEN PUMPS.—The De Laval Steam Turbine Company, Trenton, N. J., has issued a leaflet describing De Laval turbine-driven pumping units at Jackson, Mich.

FANS AND BLOWERS.—Catalog No. 475 issued by the Buffalo Forge Company, Buffalo, describes its baby conoidal fans Constructional details as well as the dimensions of all sizes are included. Various applications of these fans are illustrated and described. The company has also issued a pamphlet describing its Buffalo Electric Blowers, type FB, variable and constant speed.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Paris, France (No. 21,707), for household appliances, small electric motors and self-sustained lighting outfits.

An agency is desired in Paris, France (No. 21,707), for electric refrigerators.

An agency is desired in Neuchatel, Switzerland (No. 21,720), for flashlights.

An agency is desired in Neuchatel, Switzerland (No. 21,720), for electric household appliances.

An agency is desired in Neuchatel, Switzerland (No. 21,720), for electric refrigerators.

Purchase is desired in Bremen, Germany (No. 21,744), of electric household appliances.

Purchase is desired in Bremen, Germany (No. 21,744), of electric refrigerators.

A sole agency is desired in Amsterdam, Netherlands (No. 21,745), for electric vegetable slicers.

An agency is desired in Lille, France (No. 21,746), for electrical machinery and equipment.

An agency is desired in Paris, France (No. 21,747), for electric refrigerators.

An agency is desired in Paris, France (No. 21,748), for electric refrigerators.

An agency is desired in Paris, France (No. 21,749), for electric refrigerators.

An agency is desired in Paris, France (No. 21,750), for electric refrigerators.

Purchase is desired in Victoria, Brazil (No. 21,788) of flashlights and batteries.

Purchase is desired in Melbourne, Australia (No. 21,805), of electric Diesel or gas locomotive or car.

An agency is desired in Leipzig, Germany (No. 21,806), for generators, self-starters and magnetos and parts for same.

An agency is desired in Berlin, Germany (No. 21,807) for radio accessories, parts, tubes and crystals.

An agency is desired in Berlin, Germany (No. 21,808), for radio apparatus and equipment, especially crystal detectors.

Purchase and agency are desired in Lourenco Marquez, Portuguese East Africa (No. 21,813), for electrical machinery.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

THOMASTON, ME.—The Lawrence Portland Cement Company, Northampton, Pa., contemplates the construction of a power plant at its proposed local cement mill. The entire project will cost more than $1,500,000.

EVERETT, MASS. — Plans are under way by the Beacon Oil Company, 111 Devonshire Street, Boston, Mass., for the construction of a three-story addition to its storage and distributing plant, estimated to cost $65,000.

Middle Atlantic States

WASHINGTON, D. C.—Bids will be received by the Board of District Commissioners, District Building, until Sept. 7, for cast iron and glass fixtures and fittings, for the top of street lamp posts.

WASHINGTON, D. C. — The District Commissioners plan the expenditure of $240,000 for street-lighting equipment.

WASHINGTON, D. C.—Bids will be received by the Purchasing Agent, Post Office Department, Washington, until Aug. 25, for motors as required during the next fiscal year.

ELKTON, MD.—The Town Council has made plans for the installation of an ornamental lighting system in the business section and all the principal cross streets.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company has plans for a new steam-operated electric generating plant to cost in excess of $150,000.

ELLICOTTVILLE, N. Y.—The application of the Niagara, Lockport & Ontario Power Company for permission to erect a power distribution line has been approved by the Public Service Commission with certain limitations.

GLENS FALLS, N. Y.—The installation of new street lights to cost $23,000 will be started at an early date.

LONG ISLAND CITY, N. Y.—The Neptune Meter Company, 50 East Forty-second Street, New York, will install electric power equipment in its proposed local three-story plant on Davis Street, estimated to cost about $125,000. W. W. Knowles, Electric Building, Long Island City, is architect.

NEW YORK, N. Y.—The Packard Motor Car Company of New York, Broadway and Sixty-first Street, will install electric power equipment in its proposed seven-story electric storage and repair building on Eleventh Avenue, between Fifty-fourth and Fifty-fifth Streets, to cost about $750,000.

NEW YORK, N. Y.—Bids will be received by the New York Central Railroad Company, C. S. White, Room 344, 466 Lexington Avenue, New York, until Aug. 31, for a synchronous converter and transformer, with necessary switching apparatus and other electrical equipment for substation service (Serial Contract No. 19-1926).

QUEENS, N. Y.—The Universal Gypsum & Lime Company, care of the Palmer Lime & Cement Company, 103 Park Avenue, New York, plans the installation of electric power equipment at its proposed local plant near the head of Newtown Creek. The project is estimated to cost in excess of $500,000.

EAST PITTSBURGH, PA.—The Westinghouse Electric & Manufacturing Company will construct a one-story engineering laboratory at its local works, to cost in excess of $50,000.

PHILADELPHIA, PA.—Bids will be received by W. R. Rogers, Jr., Acting Director, Department of Public Works, City Hall, until Sept. 1, for electrical and mechanical equipment for work to be undertaken at the Northwest sewage pumping station on Wheatsheaf Lane.

GATE CITY, VA.—The American Gas & Electric Company, 30 Church Street, New York, N. Y., is planning extensions and improvements where the property of the Gate City Light & Power Company was recently acquired. The expansion will include transmission line construction.

CLARKSBURG, W. VA.—The Consolidation Coal Company, 67 Wall Street, New York, N. Y., plans the installation of electric power equipment, mining machinery and mechanical equipment at its coal properties in this section, in connection with an expansion and improvement program to cost more than $1,000,000.

HUNTINGTON, W. VA.—Bids will be received by the United States Engineer, Huntington, until Aug. 24, for submarine cable and electric lighting fixtures, switches, sockets, etc. (Circular 14).

North Central States

CHICAGO, ILL.—Bids will be received by the Signal Corps Procurement District, Chicago, until Aug. 24, for 99,600 ft. electric cord. Also, at the same time for 2,000 telephone switchboard lamps. (Circulars 40 and 41.)

GARY, IND.—The Gary Heat, Light & Water Company will soon begin superstructure for its proposed three-story and basement shop, equipment storage and distributing building, estimated to cost $200,000.

HAMMOND, IND.—The Northern Indiana Public Service Company has applied for permission to issue securities in the amount of $16,500,000, a portion of the proceeds to be used for extensions and improvements.

INDIANAPOLIS, IND.—The Inland Box Company, 1301 West Morris Street, plans the installation of electric power equipment in its proposed plant at Morris and Dakota Streets, to cost about $125,000.

COUNCIL BLUFFS, IOWA.—The City Council has passed resolution for replacing suspension street lights on Broadway between 13th and 38th Streets.

MISSOURI VALLEY, IOWA.—The City Council is considering plans for new street lights in various parts of city.

SPENCER, IOWA.—Alterations and an addition to the municipal power plant to cost $25,000 is contemplated. E. H. Penning is city clerk.

HENDERSON, KY.—The City Council has contracted with the General Power & Light Company, for light and power service to the Calhoun, Corydon and neighboring districts. Extensions will be made in transmission system.

ST. PAUL, MINN.—The Mack International Motor Truck Corporation, 25 Broadway, New York, N. Y., will install electric power equipment in its proposed local factory branch and service plant, estimated to cost $500,000.

SLEEPY EYE, MINN.—Bids will be received by the City Council, until Sept. 7, for a new boiler, 300 hp. capacity and auxiliary equipment, for the municipal power plant. Charles Baugatz is superintendent of light and waterworks.

TWO HARBORS, MINN.—A white way lighting system will be installed on Second Avenue between Cedar and Poplar Streets. Ernest Carlson is city clerk.

FARMINGTON, MO.—The Union Electric Light & Power Company will extend the transmission line which it is constructing between Crystal City and Flat River, 10 more miles to Farmington. The line will connect the Lead Belt district with the line which runs from the power plant at Cahokia to Crystal City.

KANSAS CITY, MO.—The United States Gypsum Company, 205 West Monroe Street, Chicago, Ill., contemplates the installation of electric power equipment at a projected gypsum and chipboard mill. The complete plant is reported to cost about $200,000.

POPLAR BLUFF, MO.—The Missouri-Pacific Railroad Company, Railway Exchange Building, St. Louis, Mo., plans the installation of electric power equipment in its proposed locomotive and car repair shops, reported to cost more than $250,000. E. A. Hadley is chief engineer.

ST. LOUIS, MO.—Bids have been asked by the Century Electric Company for a two-story top addition to its three-story works. E. S. Pillsbury is president.

NELIGH, NEB.—The installation of a new white way system is proposed.

CINCINNATI, OHIO.—The Rudolph Sattler Company, Third and Vine Streets, manufacturer of advertising novelties, plans the installation of electric power equipment in its proposed two and three-story plant addition, estimated to cost about $100,000.

DAYTON, OHIO. — The General Box Company, 500 North Dearborn Street, Chicago, Ill., contemplates the installation of electric power equipment in connection with proposed expansion at its local wood-box manufacturing plant, reported to cost more than $150,000.

TOLEDO, OHIO.—The Southern Wheel Company, Commonwealth Building, Pittsburgh, Pa., manufacturer of car wheels, plans the installation of electric power equipment at its proposed local plant in the Airline Junction district, reported to cost in excess of $500,000.

CLINTONVILLE, WIS. — The Central Wisconsin Power Company has approved plans for the installtion of a new hydro-electric unit and switchboard at the Wittenberg power plant. The transmission line will be reconstructed between Birnamwood, Wittenberg and Eland. About $40,000 will be spent on this work.

HURLEY, WIS.—Plans for the improvement of the street lighting system have been voted favorably upon. Highway lighting out of Hurley to the Cady location is under consideration.

PORTAGE, WIS.—The council has voted in favor of the installation of an electrically operated traffic signal system for the downtown section.

ROSENDALE, WIS.—The village board proposes to change its street lighting system by having lights at intersections instead of the present center suspension systems in the middle of blocks.

WAUPACA, WIS.—The Wisconsin Valley Power Company has adopted plans for the construction of a new concrete dam and power house which will take the place of the old equipment now in operation.

Southern States

BIRMINGHAM, ALA. — The Board of City Commissioners has approved plans for the installation of an ornamental lighting system on a portion of Second Avenue, and on a number of streets in Redmont Park.

FAYETTEVILLE, ARK. — The City Council has contracted with the Southwest Power Company for the installation of an improved lighting system in the downtown district.

MOUNTAIN HOME, ARK.—The North Arkansas Power Company will erect a transmission line from here through Gassville to Cotter.

BROOKSVILLE, FLA. — The Central Florida Light & Power Company, Dunnellon, Fla., will construct an electric switching station, equipped with circuit breakers of 60,000-volt power. The cost will be $25,000.

CORAL GABLES, FLA. — The White City Ice & Laundry Company will soon begin the construction of a new eight-story cold storage and refrigerating plant to cost in excess of $250,000.

MIAMI, FLA.—The Board of City Commissioners is considering an appropriation of close to 300,000 for the installation of an improved lighting system on main highways leading into and through the City.

TAMPA, FLA.—A proposition is under consideration for the installation of a new street-lighting system on Platt Street.

ATLANTA, GA.—The Silver Lake Company, Newtonville, Mass., plans the installation of electric power equipment at its proposed new mill at Chattachoochee, near Atlanta. It is estimated to cost more than $250,000.

REYNOLDS, GA.—The South Georgia Power Company has purchased the distribution system and will construct a power line and undertake operations.

UNION CITY, GA.—The municipal electric distribution system has been acquired by the Georgia Utilities Company, a subsidiary of the Georgia Railway & Power Company, which plans to erect a transmission line and extend the system.

WADLEY, GA.—The Georgia Southern Power Company has purchased the municipal distribution system and will construct a transmission line and take over the retail operation of the system.

GOULDSBORO, LA.—The Texas-Pacific & Missouri-Pacific Terminal Railroad, New Orleans, La., contemplates the construction of a power plant at its proposed locomotive and car repair shops at Gouldsboro, near McDonoghville. The entire project will cost more than $1,500,000. E. F. Mitchell, chief engineer, Texas & Pacific Railroad Company, T. & P. Building, Dallas, Tex., is in charge.

LEESVILLE, LA.—Plans are under way for the installation of a new white way in the business section.

GULFPORT, MISS. — The Mississippi Power Company is planning for the early construction of a new power substation, reported to cost in excess of $25,000.

FONTANA, N. C.—Plans are under way by the Tallassee Power Company for the construction of a dam and a power house.

GRAHAM, N. C.—The Tallassee Power Company, a subsidiary of the Aluminum Corporation of America is constructing a dam at Santeetlah on the Cheoah River. Also a power house at Rhymers Ferry on the Little Tennessee River.

NORTH WILKESBORO, N. C. — The Southern Public Utilities Company, Winston-Salem, N. C., contemplates extensions in its transmission line. The company is concluding negotiations for the purchase of the local municipal power plant.

ANADARKO, OKLA. — The Common Council has preliminary plans under way for the installation of a light and power system. Harry E. Musson, Oklahoma City, is consulting engineer.

HICKORY GROVE, S. C. — The City Council has plans under way for the installation of an improved electric lighting system.

LAURENS, S. C.—The Common Council is considering the installation of pumping equipment in connection with proposed extensions and improvements in the municipal waterworks for which a bond issue of $80,000 is being arranged.

COTULLA, TEX. — The Texas Central Power Company, San Antonio, Tex., contemplates the construction of a transmission line from Dilley to this place, about 35 miles.

HARLINGEN, TEX.—Bids will soon be asked by the City Council for generator, oil engine and auxiliary equipment, for municipal waterworks service.

ROCHESTER, TEX. — The Common Council will install electrically operated equipment in connection with a proposed municipal waterworks to cost $75,000. The Utilities Engineering Company, Wichita Falls, Tex., is engineer.

VAL VERDE, TEX. — The Val Verde Industries will soon begin the erection of a one-story cold storage and refrigerating plant. The cost is estimated at approximately $150,000.

Pacific and Mountain States

LOS ANGELES, CAL.—The City Council has approved an ordinance for the installation of an ornamental lighting system on Ledoux Road, Holt, Kalamazoo and Bedford Streets, from Gregory Way to Chalmers Drive, using cast-iron standards; also, for the installation of a similar system on La Mirada Avenue, from Western to Bronson Avenues, using concrete standards.

LOS ANGELES, CAL.—Bids will soon be asked on revised specifications by the Water and Power Commission for a steel tower transmission line from Coolidge Dam site to Hayden, using copper wire.

REDLANDS, CAL. — The City Council has authorized the installation of an ornamental lighting system on Center Street, between Fern and Cypress Avenues.

SAN DIEGO, CAL.—The City Council has adopted a resolution providing for the installation of an ornamental lighting system on A Street, between India and Sixth Streets.

PORTLAND, ORE.—George M. McDowell, Railway Exchange Building, Portland, Ore., has applied for permission to carry out a hydro-electric power project on the Deschutes River, Wasco County. The proposed plant will have an output of about 30,000 hp., and is estimated to cost about $3,000,000, with transmission system.

REDMOND, ORE.—The Pacific Power & Light Company, Portland, has surveys in progress for the construction of a transmission line from Bend, Ore. A similar line is also planned between Lapwai and Reubens.

BELLINGHAM, WASH. — The Mount Baker Development Company, B. W. Huntoon, manager, contemplates the installation of an electric lighting plant at a new hotel now being established on Mount Baker.

EVERETT, WASH. — The Lansdown Lumber Company plans the installation of electric power equipment in connection with the proposed rebuilding of the portion of its mill, recently destroyed by fire with loss in excess of $250,000.

Canada

KIRKLAND, ONT.—The Canada Northern Power Corporation plans to build a transmission line from the Indian Chutes power plant. The line will be between 30 and 60 miles long, depending on the route chosen.

ST. THOMAS, ONT. — Approximately $20,000 will be expended by the Bell Telephone Company in building new underground and aerial cable. Local manager is F. B. McCleary.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 27, 1926)

1,594,000. METALLURGICAL FURNACE; F. G. Breyer, Palmerton, Pa. App. filed Sept. 4, 1924. For making metallic oxides, such as zinc oxide.

1,594,020 and 1,594,022. FURNACE THERMOSTAT SWITCH; I. E. Smith, Stockton, Cal. App. filed May 26, 1925.

1,594,037. OVERLOAD-CURRENT-PROTECTIVE SYSTEM AND APPARATUS FOR MULTIPHASE-DYNAMO MACHINES; H. Balke, Berlin, L. Riefstahl, Johannisthal, and R. Zaudy, Schoneberg, Germany. App. filed May 14, 1924. Whereby the individual windings of such machines are protected from an overload current of a certain predetermined value when connected in each of the several circuit relations.

1,594,055. ELECTRICAL CONNECTOR; C. D. Filkins, Schenectady, N. Y. App. filed Feb. 4, 1922. Which may be readily attached to and detached from a conductor, as by means of a thumb screw, etc.

1,594,057. ELECTRIC INCANDESCENT DEVICE; G. R. Fonda, Schenectady, N. Y. App. filed Aug. 30, 1924. Faulting of the crystal planes in the tungsten filament at incandescence very substantially reduced

and for a given efficiency the life of the filament is lengthened correspondingly by introducing into the filament a small quantity of zirconium.

1,594,058. DYNAMO-ELECTRIC MACHINE; E. H. Freiburghouse, Schenectady, N. Y. App. filed Oct. 24, 1924. Rotor of large turbo-alternator provided with circumferentially extending grooves so that a very great reduction in the temperature rise of the rotor winding is obtained, and at the same time, the temperature rise of the armature winding is reduced and the efficiency of the machine increased.

1,594,067. SEARCHLIGHT; E. J. Murphy and L. P. Hutt, Schenectady, N. Y. App. filed May 17, 1920. Arc lamp designed for use in connection therewith.

1,594,069. SOUND-DETECTING DEVICE; C. W. Rice, Schenectady, N. Y. App. filed June 6, 1919. For detecting sounds or similar vibrations transmitted through a fluid medium and is especially useful for detecting the sounds emanating from various sources such as submarine signal stations.

1,594,087. ELECTRIC WATER HEATER; R. Arnold, T. Dumayne and A. M. Truman, Salt Lake City, Utah. App. filed Aug. 11, 1924. Instantaneous type.

1,594,096. AUTOMATIC TURN-OFF SWITCH AND LOAD-LIMIT DEVICE; L. S. Foltz, East Lansing, Mich. App. filed June 22, 1921. Whereby the circuit through the same is automatically broken at the end of an interval of time.

1,594,111. METHOD OF AND MEANS FOR ELECTRIC WELDING; A. E. Paige, Philadelphia, Pa. App. filed April 15, 1922. Arc welding, by means of a metallic electrode.

1,594,116. 1,594,117. ELECTRICAL PROTECTIVE DEVICE; F. E. Ricketts, Catonsville, Md. App. filed Aug. 15, 1919. Means for selectively protecting parallel-connected conductors. A system that shall require current-responsive relays only for controlling the protective devices and having a suitable reverse relay that shall be adapted to turn in the one or the other direction only when the circuits to which it is connected become unbalanced.

1,594,123. OVERLOAD RELAY; G. B. Scheer, Berkeley, Cal. App. filed April 29, 1922. An operating magnet for an overload relay device.

1,594,128. TEMPERATURE-CONTROL SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed July 13, 1925. Means for controlling the temperature of a heating system.

1,594,150. CURRENT-COLLECTING DEVICE; J. Burke, Erie, Pa. App. filed Aug. 30, 1923. Means and method for reducing to a minimum the heating of brushes, commutators, collectors and associated parts by reason of friction at the collecting surfaces and for other causes.

1,594,158. ELECTRIC HEATING DEVICE FOR LAUNDRY MACHINES; H. D. Else, Wilkinsburg, Pa. App. filed July 31, 1924.

1,594,205. SQUIRREL-CAGE MOTOR; T. P. Kirkpatrick, Wilkinsburg, Pa. App. filed Oct. 24, 1922. With low-resistance rotor having a composite ring of bronze and copper which shall have the requisite tensile strength and conductivity without unduly increasing the cross-section.

1,594,207. INSULATOR; W. D. Kyle, Milwaukee, Wis. App. filed July 22, 1922. Means for controlling of the type used for attaching wires to buildings or other supports.

1,594,220. 1,594,221. CABLE BOX AND CONNECTOR; H. L. Strongson, Brooklyn, N. Y. Apps. filed Dec. 4, 1922, and Oct. 18, 1923.

1,594,222. 1,594,223. CABLE CONNECTOR; G. C. Thomas, Jr., Elizabeth, N. J. App. filed Jan. 22, 1924.

1,594,224. CABLE BOX AND CONNECTOR; H. L. Strongson, New York, N. Y. App. filed Dec. 4, 1922.

1,594,225. CABLE CONNECTOR; G. C. Thomas, Jr., Elizabeth, N. J. App. filed Jan. 22, 1924.

1,594,226. CABLE CONNECTOR; J. C. Ledbetter, Brooklyn, N. Y. App. filed Jan. 22, 1924.

1,594,275. SWITCH; C. H. Spain, Tempe, Ariz. App. filed Feb. 20, 1925. For starters of internal combustion engines. A magnet for closing the switch of the starter circuit and an automatic relay for controlling the circuit of the magnetic switch.

1,594,304. THERMOSTATIC SWITCH; E. Klahn and F. L. Mullen, New Vernon, N. J. App. filed Jan. 21, 1922. For an electric heating device.

1,594,320. ELECTRIC STOVE; M. Nessif, Niagara Falls, N. Y. App. filed Feb. 11, 1925. Which may be used for cooking or which may be immersed within water in a bathtub, kettle or the like for the purpose of effecting heating of the water.

(Issued Aug. 3, 1926)

1,594,362. ELECTROTHERMAL REDUCTION OF ALUMINA; F. C. Frary, Oakmont, Pa. App. filed April 10, 1924.

1,594,398. ELECTRIC MOTOR; J. Wolkoff, East Orange, N. J. App. filed Jan. 20, 1923. Having means whereby the direction of rotation of the armature may be reversed by varying the positions of the commutator brushes with respect to the poles of the field magnets and means for reducing the speed of the motor by cutting out two of the brushes and their contact bars.

1,594,406. CIRCUIT-CONTINUING DEVICE; H. A. Douglas, Bronson, Mich. App. filed Jan. 5, 1921. Socket for minature lamp.

1,594,456. PLUG TERMINAL; A. A. Conway, Loyalist, Alberta, Canada. App. filed June 8, 1925. Adapted for use in electromagnetic circuits.

1,594,486. DRY BATTERY; A. T. Baldwin, Montclair, N. J. App. filed May 22, 1923. Multicell battery unit.

1,594,496. ELECTROFINING GLASS FURNACE; W. G. Clark, New York, N. Y. App. filed April 6, 1920.

1,594,552. GENERATOR-PROTECTING DEVICE; H. M. Okano, El Centro, Cal. App. filed Oct. 21, 1925. To prevent the burning out of the generator through continuous running or operation with the circuit thereto open, as in an automobile generator.

1,594,567. LIFTING MAGNET; J. E. Sederholm, St. Paul, Minn. App. filed Feb. 15, 1926. Of the cylindrical-case type, wherein there are no joints in the magnetic circuit; a magnet, without a pole shoe, and with the coils secured and sealed within the magnet case without producing a joint in the magnetic circuit, thus eliminating the use of pole-shoe structure and attendant localization effects.

1,594,568. SWITCH; G. J. Seiss, Toledo, Ohio. App. filed April 3, 1924. Comparatively minute electric switch for opening and closing the circuit of bicycle lamps and electric cells, such as dry cells.

1,594,597. ELECTRIC MOTOR; S. A. Brown and E. W. Brockmeyer, Dayton, Ohio. App. filed Oct. 17, 1925. Brush mounting for split-phase type.

1,594,635. ELECTRIC LIGHT BULB; F. T. Skogland, Minneapolis, Minn. App. filed Nov. 26, 1923. Designed primarily for use in connection with the head and tail lights of automobiles and other vehicles. Headlight bulb having an integral light diverging and modifying means and tail light provided with a red-glass portion, the remainder of the bulb being of clear glass.

1,594,647. ELECTRICAL COIL; C. H. Thordarson, Chicago, Ill. App. filed Oct. 27, 1920. So constructed that the parts of each turn of the coil or winding which lie in the straight parts of the coil between exterior angles are preformed to give a permanent set to said parts to cause said parts of the turns to tend toward the axis of the coil and thereby prevent the conductor or wire from loosening and from bulging outwardly away from the straight sides of the coil or winding, and also reducing liability of the insulation to be scraped off the turns. The construction also results in a very compact winding in which a large number of turns can be wound in a small space, thus reducing the dimensions of the coil or winding as a whole and improving the electromagnetic function of the coil or winding.

1,594,656. ELECTRIC ELEVATOR; P. H. Brodesser, Milwaukee, Wis. App. filed June 2, 1922. System for controlling elevators by which the elevator may be accurately stopped in correct alignment at the desired floor.

1,594,676. SILENT ELECTRIC SWITCH; M. M. Larsen, Colton, Cal. App. filed Jan. 6, 1925.

1,594,701. TRANSFORMER; C. M. Welch, Ogden, Ark. App. filed Aug. 26, 1921. To secure a directed settling of water and foreign matter from the body of insulating fluid and means for isolating the precipitated fluidity substance from the insulating fluid proper.

1,594,715. ELECTRIC BRAKE; D. R. Figg, Shepherd, Mich. App. filed Oct. 8, 1919. Susceptible of general application, but particularly useful for motor vehicles.

1,594,734, 1,594,735. INSTRUMENT LIGHT; E. N. Jacobi, Milwaukee, Wis. App. filed Jan. 29, 1920. As used on the instrument panels of automobiles and for similar purposes.

1,594,751. COVER FOR ELECTRIC CONDUIT OUTLET BOXES; J. T. Pearson and R. H. Olley, Syracuse, N. Y. App. filed May 16, 1922.

1,594,814. BATTERY INDICATOR; W. A. Brodin and G. S. Rickenbach, Pittsburgh, Pa. App. filed Oct. 8, 1924. Means for automatically indicating the condition of the electrolyte in a battery, not only as regards the specific gravity of the electrolyte, but also the level of the same within the battery.

1,594,817. ALARM PROTECTION; F. E. Crawford, Winchester, Mass. App. filed Aug. 12, 1921. Protective device for safety vaults and the like, of the class characterized by the employment of an electric protection layer, normally in circuit with sound or other alarm devices, which on being punctured or otherwise deranged produces an abnormal condition in the alarm circuit and automatically gives notice that it has been disturbed by some intrusive agency.

1,594,841. BUTTON SWITCH; W. J. Klein, Buffalo, N. Y. App. filed July 21, 1924. Wherein the button-actuated spring contact employed will have a wiping action against its coacting contact.

1,594,856. HANDLE-CAP PLUG; H. E. Slade, Glen Ridge, N. J. App. filed April 29, 1926.

1,594,923. ELECTRIC SWITCH; C. L. Brown, Abilene, Kan. App. filed May 13, 1925. Of the type employed to automatically interrupt high-voltage circuits, which will efficiently meet the requirements imposed by rural conditions, which will effectively protect the transformers and other elements incident to the distribution of current for domestic use over high-voltage lines, which will enable the fusing element thereof to be replaced by unskilled labor at relatively small expense, which will permit removal and replacement of the fuse blade from and to the switch by inexperienced persons without danger and which will be substantially "foolproof."

1,594,925. CONDUCTOR CLAMP; H. P. Chandler, Mansfield, Ohio. App. filed Sept. 20, 1922. A clamping connector for use in mines where electrically operated machines are used at a distance from the source of supply of electrical energy and where the location of these machines is shifted from time to time and, therefore, a connection to the electric conductor from which the current is taken is required to be temporary and movable.

1,594,926. SECTIONALIZING SWITCH; H. P. Chandler, Mansfield, Ohio. App. filed April 28, 1925. For use with trolley conductors.

1,594,927. CONDUCTOR SUPPORT; H. P. Chandler, Mansfield, Ohio. App. filed Sept. 23, 1925. For supporting a trolley wire and simultaneously therewith a cable known as a feeder conductor if it is electrically connected to the trolley conductor through the medium of the supporting device or otherwise, but which may be insulated from the supporting device and trolley wire if desired.

1,594,949. LIQUID-COOLED GENERATING UNIT FOR HIGH-FREQUENCY APPARATUS; H. B. Hartman, Scottdale, Pa. App. filed Oct. 29, 1924. Ozone generator particularly adapted for use in connection with high-frequency currents.

1,594,970. CONDUCTOR SUPPORT; S. S. Matthes, Mansfield, Ohio. App. filed Feb. 25, 1925. For supporting trolley conductors from a cross-span support or a catenary messenger cable.

1,595,003. HEATER CONNECTOR PLUG; J. B. Downing, Orange, N. J. App. filed May 17, 1926.

1,595,061. ELECTRIC CUT-OUT; J. Valerius, Breslau, Germany. App. filed Oct. 12, 1923. In which in an insulating body between two metal contacts embedded in said body a thread of liquid metal, preferably of mercury, is arranged which electrically connects said contacts and which is narrowed so that it is capillary, the liquid metal vaporizing at the capillary point at excessive increase of the current whereby circuit is interrupted.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Electrical Energy Increasingly Woven Into the Industrial Fabric

WHETHER our attitude toward the present order be one of enthusiastic appreciation of the material comforts so widely enjoyed or of regret for the passing of the individualism and craftsmanship of an earlier and more bucolic existence is a matter of personal sentiment.

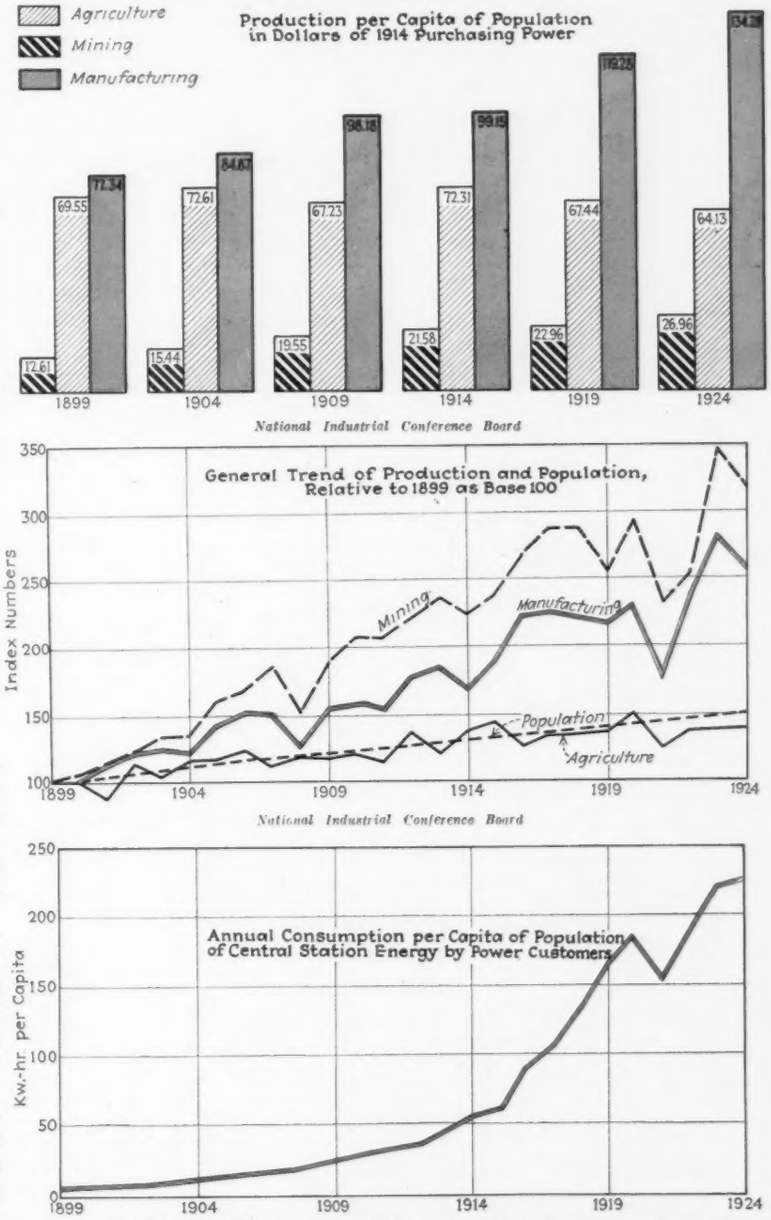
The fact remains that we do utilize an amazing multiplicity of devices which have become an integral and essential factor in our daily life. They have been made possible by methods of quantity production and by the utilization of mechanical power, for only by producing more rapidly than it consumes can a population accumulate conveniences and, ultimately, luxuries.

Only the harnessing of mechanical power could bring about so general a distribution of material possessions that one family in five can own a radio set, and three out of five can have automobiles, as is stated to be the case in the United States at the present time.

While, relatively to population, our production of manufactured articles has substantially doubled in a quarter century, and while this rate has been somewhat exceeded in the mining industry, the rate at which electricity has taken over the burden of performing the tasks involved has been far more rapid.

Having regard only to that portion of our central-station energy which was sold to power customers as distinguished from residential and other users, it is seen that instead of doubling in twenty-five years the consumption of electrical energy per capita has quadrupled in a decade.

It may appeal to our appetite for the dramatic to liken our twenty-two-odd million kilowatts of central-station machinery to nearly a billion slaves who need no grain nor meat nor raiment, forty of them to every family. They would outnumber us eight to one.



Central Station Energy to Industries Far Outruns Growth in Production

But the difference in growth shown by the charts is, in a more practical sense, a fact of large social and economic significance.

In part, it doubtless means the supplanting of human effort by machinery, leaving to man the higher function of controlling forces vastly exceeding those of his own muscles. In larger part, however, it signifies the replacing by centrally generated electrical energy of less economical or less controllable sources of mechanical energy and heat.

In so far as the central station converts into useful form more of the energy of its fuel than does an isolated plant, in so far as it permits the utilization of great sources of water power too vast for immediate local application, and in so far as the interconnection of power systems makes ever for economy in the use of primary forms of energy, just so far does this increasing electrification connote a conservation of our national wealth which, in the long run, must redound to the benefit of us all.

Fuel saved means more than simply a reduction of cost per kilowatt-hour. It means to the community, especially in the densely populated sections of the country, an amelioration of freight congestion as well, and to the nation a saving of its resources.

Industrial Conditions in the Western States at Peak

THE properous condition which has been prevalent in the manufacturing plants of the Western States since the opening of the year appears to have reached its peak in June. July activity in the general industrial life of the section was slightly below that of June, only one of the primary industries recording operations above those reported for the preceding month. July activity, however, was still 21 per cent above that reported in June of last year and was also 21 per cent above the average monthly activity for the past three years. The industries of the West appear to be operating at a higher rate of activity at the present time than those in any other section of the nation and to be maintaining that high rate of activity in a more consistent manner. Such is the picture of industrial activity painted by the ELECTRICAL WORLD, based upon the monthly electrical energy consumption of about 400 large manufacturing plants in various industries and scattered throughout the section.

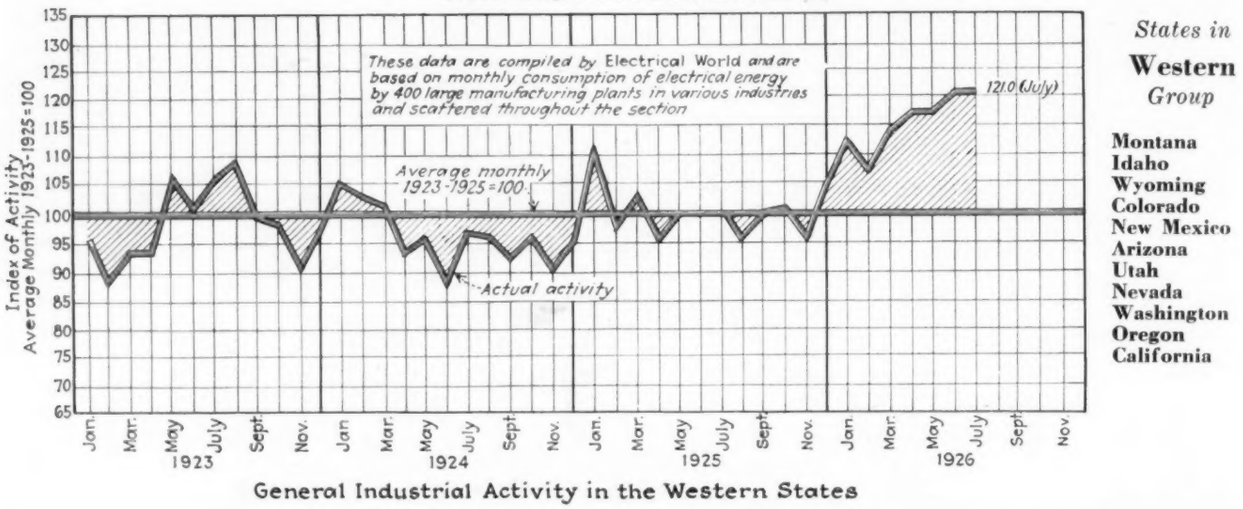
Not only has general industry in the Western States been operating since the opening of the year above the average for the past three years, but this activity has been materially above that recorded by general industry in the country as a whole during the same period. In the nation as a whole the peak of industrial activity was reached in March, since which time industrial operations have steadily decreased, the reflection very largely of seasonal influences. In the Western States, however, the peak of industrial operations was not reached until June, and July activities were only slightly below the June peak.

The food and kindred products industry, the chief industrial group of the Western States, reported materially increased operations during July. The summer months are normally the season of greatest productive activity in the food industry, so that this increased activity is largely seasonal in character. July activity in the food industry was 4.4 per cent above the operations reported for July last year and 10.5 per cent above the average monthly for the past three years.

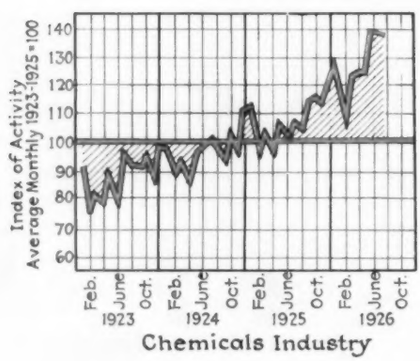
Operations in the lumber mills during July were 4.8 per cent under those of June, but 7.0 per cent over July of last year. The lumber industry reached its peak of operations during March, since which time it has decreased its activities month by month, though keeping materially above the operations of last year.

"Electrical World" Barometer of Industrial Activity in the Western States

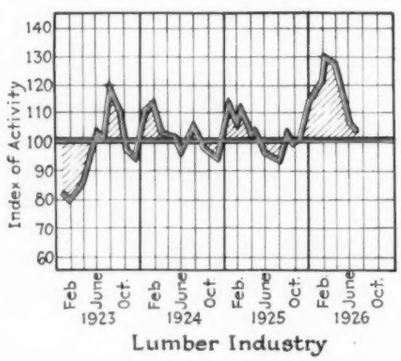
(Data Unadjusted for Seasonal Variation)



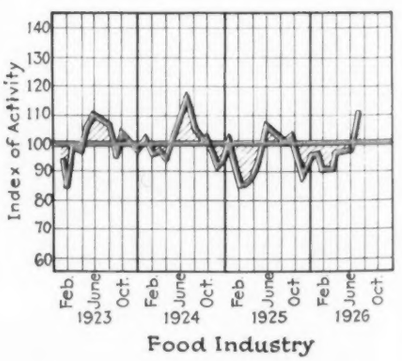
General Industrial Activity in the Western States



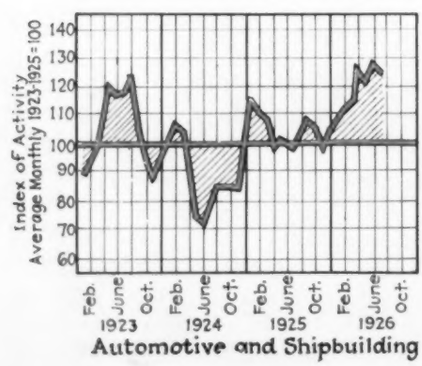
Chemicals Industry



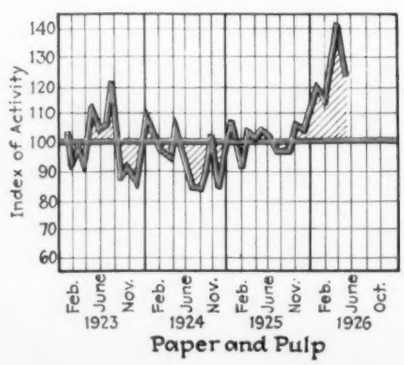
Lumber Industry



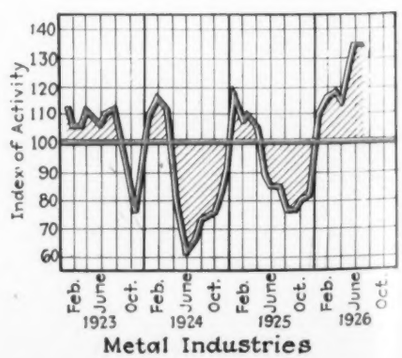
Food Industry



Automotive and Shipbuilding



Paper and Pulp



Metal Industries